

Green Zia Environmental Excellence Program

Printing



*Guidance for improved environmental
performance and pollution prevention in
your printing business*

Acknowledgements

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Guidance materials for printing.

Introduction

This workbook contains information on how to establish a pollution prevention program specific for a printing operation. The workbook also contains waste management and regulatory guidance materials to help assure that you are in compliance with environmental, health, and safety regulations. Used together, this information can help you establish a pollution prevention program that will help you be in compliance and reduce waste. Use of the tools from start to finish also helps you qualify for the Green Zia Environmental Excellence Program.

The Green Zia Environmental Excellence Program is a voluntary program based on quality management principles that is designed to help New Mexico businesses achieve environmental excellence through pollution prevention programs.. This program is administered by a partnership of state, local, and federal agencies, academia, private industry, and environmental advocacy groups. This packet has been specifically developed for a printing operation and is designed to meet the needs of a small business.

The basic logic of the Green Zia Environmental Excellence Program is that:

- waste or pollution is the result of inefficiency;
- reducing waste increases profits;
- waste that is not created cannot pollute.

This guidance has been developed to aid in your company's understanding of best management practices to help your company comply with environmental health and safety regulations and to reduce waste and associated liabilities.

It is important to remember that environmental health and safety regulations are triggered by the use of equipment and chemicals. Better use of chemicals, use of safer chemicals, and efficient operation of machinery can help reduce your regulatory burden—if you aren't using hazardous materials, then you have fewer regulations to be concerned with! This program is based on first understanding work processes and materials use and then improving work practices to reduce cost, waste, and regulatory concerns.

Working through the Green Zia Environmental Excellence Program will result in a system that helps address environmental issues in cost effective ways, based on sound

business practices. The system provides a framework for continuous improvement over time and contributes to a thorough understanding of environmental issues in your business.

What is Pollution Prevention?

Simply put, pollution prevention means not creating a waste in the first place. Pollution prevention is achieved by the efficient use of resources, including raw materials, energy, water and even time and distance. The goal is to produce a product or deliver a service as efficiently as possible, with the least amount of wasted materials and the least possible environmental impact.

The bottom line is that pollution prevention or improved efficiency can help businesses save money and help protect the environment at the same time.

What is Environmental Excellence?

Environmental excellence means moving beyond compliance with environmental, health and safety regulations by establishing an environmental management system that incorporates pollution prevention into core business practices.

A prevention-based environmental management system will:

- Help a business identify *all* the environmental compliance and health and safety concerns as well as costs associated with a waste generating process, and
- Use prevention approaches to reduce or eliminate the waste and reduce the associated costs.

In the Green Zia Environmental Excellence Program, attention is focused on the *process* that generates the waste, not the waste. Identifying and implementing process improvements will reduce waste and costs. This is a major shift from the traditional, reactionary approach that concentrates only on managing wastes or pollutants already created to an anticipatory approach that concentrates on prevention of wastes or pollutants to improve environmental and economic performance. This prevention-first environmental management system will identify cost effective ways to achieve "beyond compliance" status, creating a win-win situation between economics and environment.

The Green Zia Tools

The Green Zia Program provides tools to establish a basic prevention-based environmental management system. Management and employees walk through the tools as a team to gain a complete understanding of their operation. Examples have been worked out for the auto repair business. We encourage you to customize the examples to your own operations. The packet includes a series of process maps (Tool 1) for some operational areas of the auto repair business. Tools 2-6 are also explained and illustrated to help you develop your program. Use of these tools on a regular basis will help your company qualify for the Green Zia Environmental Excellence Program.

Green Zia Tools:

Knowledge of Process

Tool 1: Process Mapping: Illustrates the work steps materials pass through as they are transformed into your final product. Maps allow for the identification of all inputs and outputs such as water, chemicals, electricity or other materials from a process, helping you to understand wastes and their sources. Maps also help you understand regulated activities.

Full Cost Accounting

Tool 2: Activity-Based Costing: Identifies the true costs of wastes or losses and helps participants identify areas to target for pollution prevention, by assigning dollar values to these wastes and losses.

Pinpointing Problems

Tool 3: Root Cause Analysis: Creates a cause and effect diagram to highlight why and where the losses occur in the process. Understanding why and where the loss occurs will help participants focus on specific areas for improvement.

Problem Solving

Tool 4: Brainwriting: Addresses problems by generating as many alternatives as possible to minimize loss.

Prioritization of Options

Tool 5: Bubble-up-bubble-down: Ranks alternatives to determine the optimal solution. Factors such as cost, ease of implementation and effectiveness are considered in evaluating and ranking the alternatives.

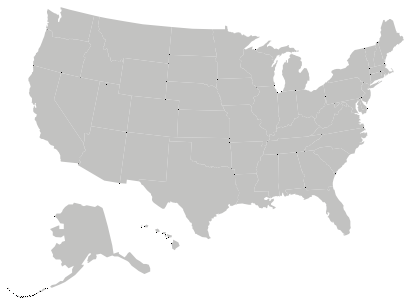
Ensuring Success

Tool 6: Action Plan: Details each step that needs to be taken to implement the alternative and reduce or eliminate the loss from the process.

Tool #1: Process Mapping

To begin incorporating pollution prevention into your business, you must first get a full understanding of where wastes are being generated. This tutorial will discuss the advantages of using process maps to logically evaluate each step of your process.

Warm-up Exercise



Maps have been used throughout the ages for many purposes from helping sailors navigate the seas to providing a safe route for climbers hiking to the tallest peaks. You have probably drawn maps to your home or office so that someone could visit. It is important that the information on this map is complete and accurate or, as you may have found, your guest will get lost!

Take a minute now and think of a coffee shop or restaurant nearby that everyone in the group knows. Draw a map from the building you are currently in to this establishment - include traffic lights, landmarks, and any other important features along the way. Now compare maps with the other members of your group. Are they the same? If a person not familiar with the area were to use your map, would they have found their way?

Introduction

Are you aware of the amount of waste that your business generates? Could this waste be turned into profit? By considering methods of reducing wastes, recycling used and unused raw materials, and reusing lost material, you could not only help the environment but also reduce your raw material and waste disposal costs.

This section discusses process mapping, a method of analyzing a process in order to catalogue all the materials used and lost in the process. With process mapping, you will systematically identify the series of steps materials pass through as they are transformed into the final product. Evaluating your process in this manner will allow you to recognize the opportunities to prevent losses and possibly streamline operations. Each loss identified during the process mapping is an opportunity to prevent that loss.

A series of process maps have been developed for printing operations and are included in this packet. You should customize these maps for your operation, since no two businesses are exactly alike. These maps become a reference for you to use for your pollution prevention program and can be updated to reflect changes as you improve your operations. These maps are also great for training new employees and for other problem solving needs.

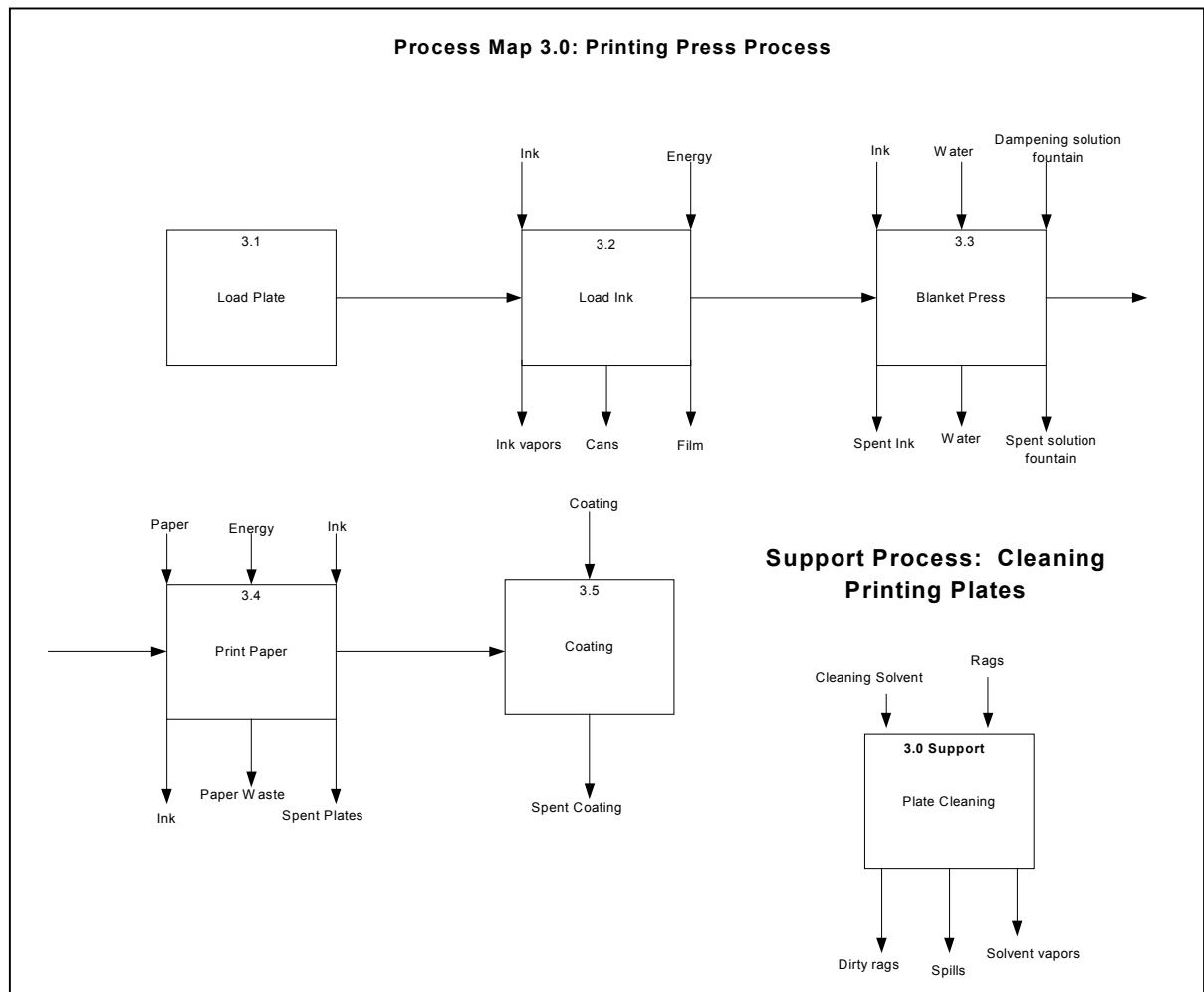
Large businesses and manufacturers use these tools to understand and improve their manufacturing processes. Small businesses can benefit by using these tools as well!

It is helpful to also prepare a narrative to go along with your process maps to explain the process in detail. We recommend that you include regulatory activities in the narratives as part of your environmental management system. Narratives are also included in this packet; please revise to reflect your business operations.

Create a team of employees to complete this exercise. During this exercise you will:

- Examine and revise the process maps and narratives in the packet to accurately reflect your operation
- Fully understand the functionality of each step of a process
- Identify the inputs and outputs/losses within the process
- Communicate findings in a clear and concise manner to members of the team.

Example of a process map for printing:



Please review the process maps in the back of this booklet and make changes to reflect your operation.

Once you have reviewed and revised the process maps to your operation, move to the next section...Activity-Based Costing!

Tool #2: Activity-Based Costing

Every waste or environmental loss costs you money. By determining the activities that cause waste, you can focus your pollution prevention efforts to minimize the cost to your business and protect the environment. This tutorial will introduce you to a method of evaluating your waste.

Warm-up Exercise



Your daughter approaches you one evening and says that she is planning to buy a car. With the \$400 she has left over each month, after paying all of her bills, she is sure she will be able to afford the \$220 monthly car payment.

What are the other costs of operating and maintaining a car that she is forgetting? Consider not only the annual costs, such as insurance, but also the intermittent (once in a while) costs. Can she really afford this car?

Introduction

Once you have determined the losses in your processes through your process maps, you can discover how these losses are affecting your “bottom line”. How much does it cost you to discard 10% of your raw materials, or 2% of your finished products? Which activities have losses that most hurt the profitability of your company? This tool will help you look at the cost of the losses in your business and see how much these losses are costing you. The results may surprise you!

Which losses should you care about? The Pareto Principle suggests that 80% of the problems in a business come from 20% of machines, raw materials or operators. (The same is true for any facet of a business, for example, 80% of sales come from 20% of your customers, etc.) Once you have assigned costs to your activities, you can figure out which 20% of your activities are contributing to 80% of your costs. The Pareto Principle is very important in activity-based costing as it is used to focus on the most important areas for improvement in your pollution prevention program. Use of the Pareto Principle for the activity-based costing section will help you quickly identify areas of your business to focus your prevention efforts.

New Terms

Activity based costing (ABC) - An accounting method used to assign the cost of your losses to the activities that generate these losses. By assigning costs to activities, you will discover the activities should be targeted for prevention.

Environmental costs -The costs associated with the losses in your process.

Intermittent or support operations – Operations that occur once in a while that are necessary for the key processes to operate.

Pareto principle - A principle that suggests that 80% of anything can be attributed to 20% of the factors involved. For example, 80% of your environmental costs can be attributed to 20% of your activities.

Activity-Based Costing

1. Make a list of all the activities in your operation. Be sure to include the activities from your process map as well as any intermittent operations (such as cleaning or maintaining equipment.).

Regular activities:

- Making proofs
- Developing film
- Printing
- Mixing inks
- Selecting paper
- Binding
- Packaging

Support activities:

- Cleaning print presses
- Record keeping
- Equipment maintenance
- Recycling solvent
- Cleaning ink cans and ink-covered items
- Managing waste ink
- Managing dirty rags
- Equipment maintenance

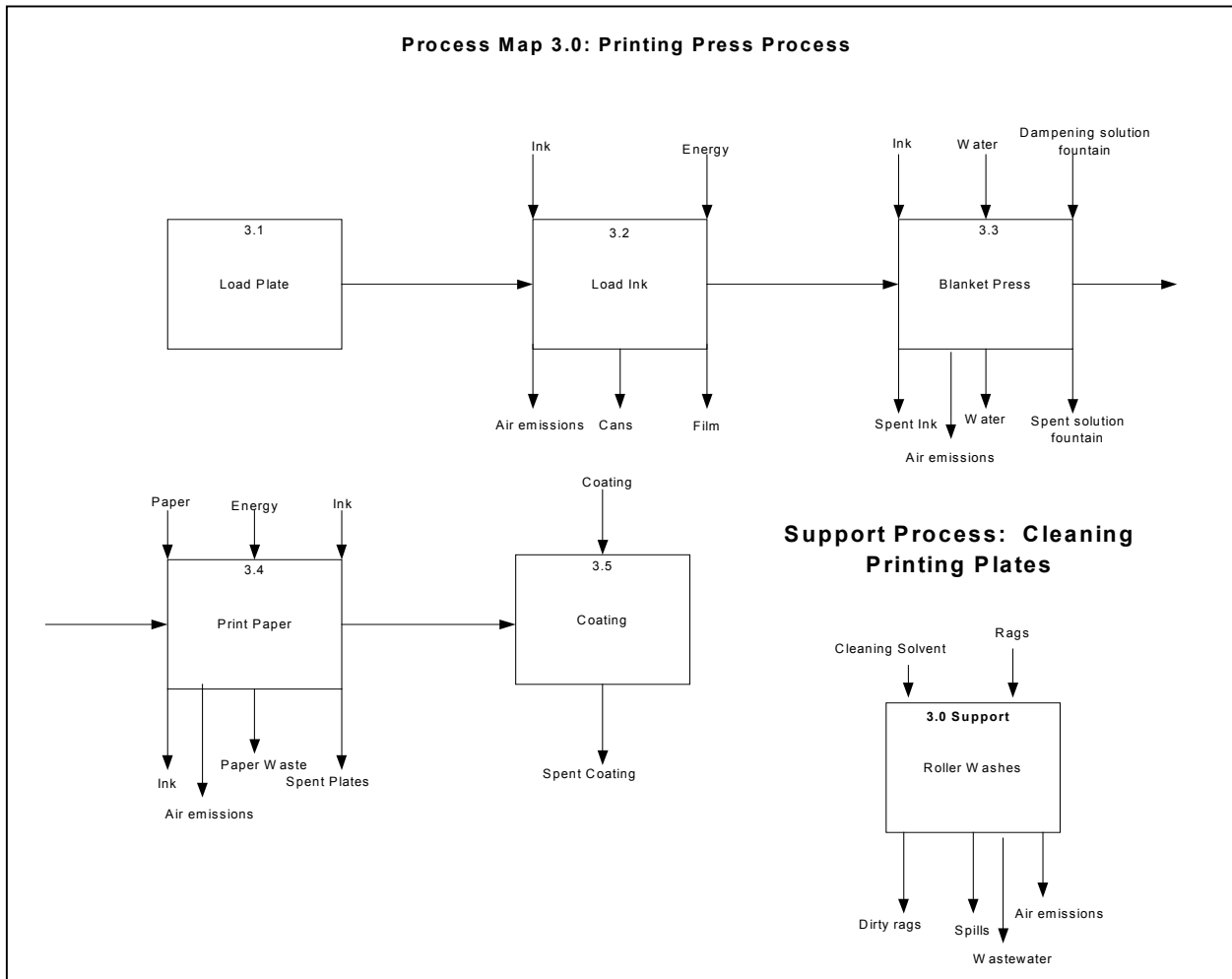
2. List all of the losses in your operation. Look on your process map and add any others that you think of.
3. Reviewing your process maps, identify the operations in your plant that generate most of your waste or pollution problems. For example, does solvent use cause most of your environmental problems? Do wastewater from roller washes or air emissions from solvent-based inks your biggest problem result in your biggest problem? Does the 80/20 Rule apply? Focus your efforts for now on the areas of your operations that you do the most or that create the biggest environmental problem for you.
4. Use process maps to review material use and losses for your selected process or operation. You will use these maps as a guide to assign costs to these losses.
5. Identify which major costs or general ledger costs apply to the material use and losses on the process maps (utilities, chemical purchase costs, waste disposal

costs, costs that are easy to get information on and that you typically consider when looking at your processes). Enter into Table 1. (See example provided)

6. Identify which other activities are related to the use of these materials that are not in the major costs (protective equipment such as gloves or goggles, monitoring, record keeping, maintenance, permits, rag laundering service, waste management service contracts, fees to the state or city, storage space for chemicals, the cost of spill clean-up and reporting). These activities are not usually considered when thinking about the cost of a process, yet the costs associated with them can be significant.
7. Write the activities in the first column of Table 2. Along the top list all the costs or services required for these activities. Add or delete categories as appropriate for your business. Put an “x” for every cell that applies.
8. Count the total number of “x’s” in Table 2. Then circle the x’s that represent what you estimate to be about the top 20% of the most expensive activities in your operation. Again, you are using the 80/20 rule: 20 percent of your activities will probably add up to about 80% of your total costs.
9. Then estimate only the cost of each of these top 20% of activities that you circled and write them in a new table. Cost estimates are allowable as you are using this method to prioritize your most expensive activities. You can refine costs once you have chosen a project to work on. (In the example, the top 20% of the cost categories chosen have the estimate beside them.) Add these numbers into Table 1 under the appropriate waste stream in the “Hidden costs” line.
10. Add the ledger costs and the hidden costs together to discover the true costs.
11. Create a Pareto Chart. Create a chart showing all these costs graphically. On the x axis (vertical), place costs in dollars, on the y axis (horizontal), show the true costs of the wastes. This chart will help graphically show how all the costs stack up against each other. Does the 80/20 Rule apply here? Use this chart to identify the most expensive processes. This can be used to identify the first area for improvement. Which waste stream do you think you should focus on from this Pareto chart?

An example of Activity-Based Costing is provided in the next section. Please note that this is an example to demonstrate how to assess costs. The costs included are not from an actual case study. Water and energy costs are not included in this example but should be considered in developing improvement and cost saving projects. The example provided addresses only the major processes in a printing operation. Environmental improvement can be applied to every waste generating activity in your operation!

Activity-Based Costing Example



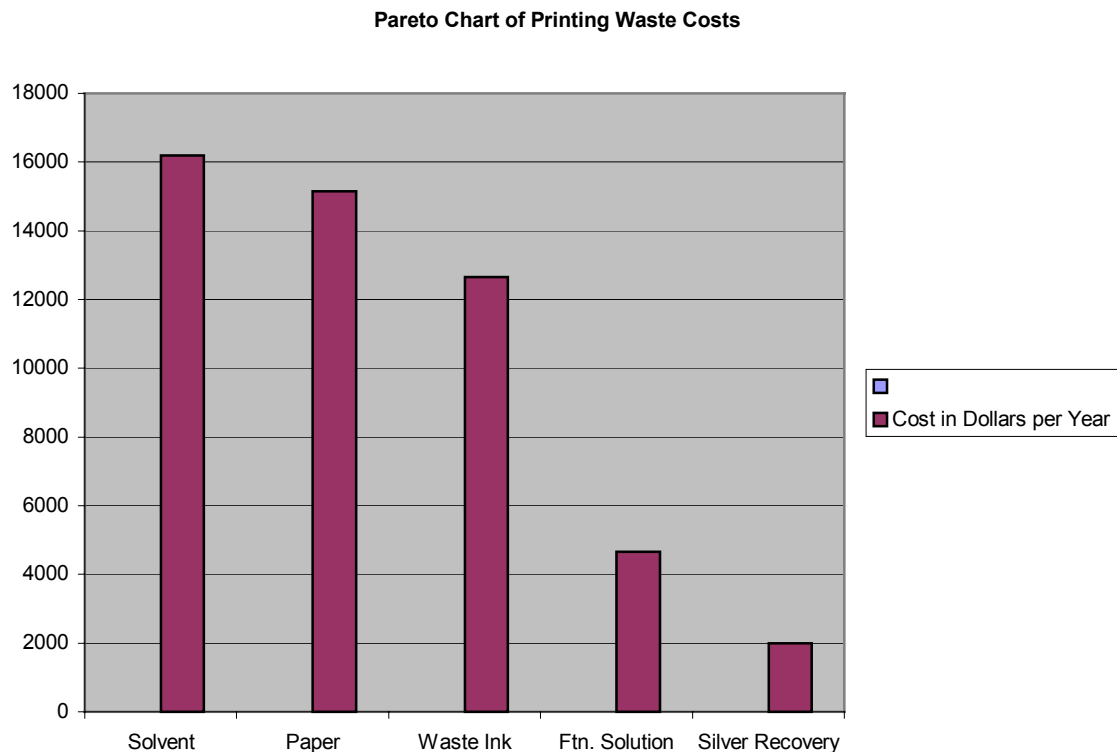
Activities	Materials and Losses
Proof Making Printing Binding Maintenance	Wastewater *Fountain Solution *Energy (major cost across organization) Silver from developing *Waste Ink *Solvent *Rags *Paper (*) indicates most important waste streams and materials

Table 1. Activity-Based Costing Analysis (Per year)

Workstep						
Costs/Losses	Solvent	Waste Ink	Fountain Solution	Silver Recovery	Waste Paper	Total
Raw material	\$2,000	\$3,000	\$2,500	\$2,000	\$2,500	\$12,000
Disposal fees	\$2,500	\$6,000	\$500	+\$500	\$5,000	\$13,500
Other ledger costs					\$150	\$150
Hidden Costs	\$11,700	\$3,650	\$1,650	\$500	\$7,500	\$25,000
Total	\$16,200	\$12,650	\$4,650	\$2,000	\$15,150	\$50,650
%of Total	.320	.250	.092	.039	.300	1.0

Table 2. Hidden Cost Analysis (per year)

<i>Solvent</i>					
Activities/Cost Factors	Materials	Space	Utilities	Services	Labor and or fee costs
HW Gen. fees					X (\$2,000)
Reporting					x
Red rags laundering	x	x		X (\$4,000)	x
Recycling contract	x			X (\$5,200)	x
Vent. equip	x	x	x	x	X (\$500)
Air Permit	x			x	x
Total hidden costs for solvents					(\$11,700)
<i>Ink</i>					
Record keeping					x
HW Gen. fees					X (\$650)
Recycling services	x	x		X (\$3,000)	
Cleaning equip.	x			x	x
Total hidden costs for ink					(\$3,650)
<i>Fountain solution</i>					
HW Gen. fees					x
Discharge fees					X (\$1,650)
Cleaning equip/filters	x				x
Water use fees					x
Total hidden costs for fountain solution					(\$1,650)
<i>Silver Recovery</i>					
Materials mgmt.	x	x			x
Discharge fees				x	X (\$500)
Filters	x			x	x
Total hidden costs for silver recovery					(\$500)
<i>Paper</i>					
Handling				x	X (\$7,500)
Total hidden costs for waste paper					(\$7,500)



Pareto Chart for Printing. The Pareto Chart illustrates costs relative to each other and helps choose areas to target for pollution prevention activities. In this example, solvent use, the most expensive loss, will be the focus of the pollution prevention efforts in the following sections.

Now that the process mapping and activity-based costing are completed, you have a sense of the relative environmental costs of your operations. Since solvent use is the target, we will use the following problem-solving and decision-making tools to find a way to reduce solvent use, increase efficiency and save money.

Most of your work is done. These two tools can be revised as needed. Use these maps and information annually (or more often!) to keep improving your operation on an ongoing basis. Now that you have identified your most expensive wastes, you can now move towards solving problems and eliminating waste...the next tool is Root Cause Analysis!

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs/Losses							Total
Labor							
Raw material							
Disposal fees							
Other ledger costs							
Hidden Costs							
Total							
%of Total							

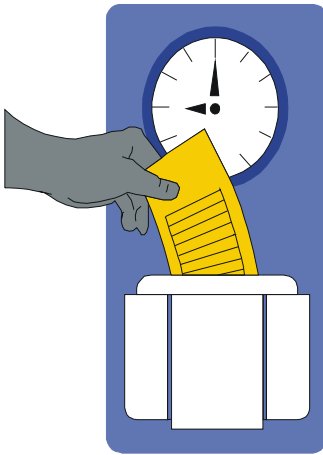
Table 2. Hidden Cost Analysis (per year)

Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
<i>Waste Stream</i>					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					
<i>Waste Stream</i>					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					
<i>Waste Stream</i>					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
<i>Total hidden costs for (waste stream)</i>					

Tool #3: Root Cause Analysis

Now that you have recognized the activities in your process that are costly or expensive to your business, you can begin to focus your efforts on pollution prevention. This tool presents a method of detecting the underlying reason for an environmental loss so that the loss can be prevented.

Warm-up Exercise



Think of all of the times that you have been late for work and list the different reasons for your delay. Maybe your alarm clock did not go off, or perhaps your child was sick and you needed to arrange for a sitter. Did you spend too much time reading the newspaper or did you need to run to the store to pick up milk.

Arrange all these reasons in the categories listed below, or create an additional category. Some of the items on your list may be entered more than once. Now consider the last time you were late for work. Why were you late? Circle the reason.

MACHINES

broken alarm clock

PEOPLE

sick child

METHODS

reading the newspaper

MATERIALS

out of milk

Introduction

In the last tool you determined the key losses responsible for the greatest amount of environmental costs. In order to try to prevent a loss, you must first understand why it is occurring. The underlying reason for a loss is also known as its “root cause”. The root cause will answer the question: What *ultimately* caused the loss? Determining the root cause of an environmental loss is very similar to determining the root cause of being late for work

A cause and effect diagram is one method of determining the root cause for a loss. This tool provides a visual description of all possible causes for a specific loss. Once all the possible causes are depicted on the diagram, the most plausible cause or causes are identified. It is imperative that all persons involved in determining the root cause are in agreement. The next step is to write a “Dear Abby” letter summarizing the cause or causes for a loss will ensure that all participants see the problem in the same way.

During this exercise you will:

- Construct a cause and effect diagram with all potential causes for a loss.
- Discuss the most probable cause or causes.
- Write a Dear Abby letter describing the reason for the loss.

Root Cause Analysis

After participating in process mapping and activity based costing exercises, it was determined that the largest loss, solvent use, accounts for approximately 80% of all environmental costs in the printing operation. The next step is to discover the root cause of this loss.

To determine the root cause of a loss, you must ask, “Why is the loss occurring?” One way of gathering information concerning the generation of a loss is called a cause and effect diagram, or fish bone diagram, since it resembles a fish bone. Major categories of possible causes for the loss are first defined and entered on the diagram as an offshoot from a main horizontal line. Next, all possible causes of the waste are assigned to a category and entered on the diagram. Once all the causes are defined, an agreement is made as to the most plausible reason for the loss.

Divide the causes into four major categories - Methods, Machines, Materials, and People - and then write down all the possible reasons why solvents could be lost from the process and assign them to a category. Begin the diagram and then write down some of the things that immediately come to mind. An example has been provided in Figure 2.

Several things may come to mind. Inks must be mixed to meet color specifications. Fountain solutions containing solvents must be prepared. Rollers must be cleaned thoroughly. Waste drums containing inks and solvents must be managed properly. Red rags from cleaning processes generate hazardous waste. Drums containing red rags accumulate liquid solvent in the bottom of storage drums creating health and safety issues and hazardous waste. Spills must be cleaned. Machine maintenance is critical in assuring production with minimal downtime. Also people operating the machines are critical and training and a good work attitude are critical to efficient operations. All of these ideas should be entered under one of the four categories in the fishbone diagram: Machines, Methods, Materials and People as in the example in Figure 2.

Now that all the possible causes of solvent being lost during the printing process are categorized, it is time to determine the most probable cause. Go back to the diagram and circle the most probable causes. One of these should be the root cause. Then, working with employees as a team, discuss which one of these major causes is the root cause. To come to clear understanding of the root cause, we suggest that the team write a short “Dear Abby” letter describing his or her interpretation of the problem to ensure that each person sees the problem the same way. Once the letter is in place, the group becomes Abby and seeks to solve the problem. (*see Figure 3*)

Another method for determining the root cause of a problem is the “5 whys”.

By asking the question “why?” five times, you may get to the root cause of a problem. An example of how the five whys works is as follows.

The Five Whys:

1. Why has the machine stopped forcing an interruption in production?
A circuit breaker tripped due to an overload.
2. Why was there an overload?
There was not enough lubrication for the bearings.
3. Why was there too little lubrication for the bearings?
The pump was not pumping enough lubrication.
4. Why was there not enough lubricant being pumped?
The pump shaft was vibrating because of abrasion
5. Why was there abrasion?
There was no filter, which allowed chips of metal to get into the pump.

The solution is then to place a filter on the pump to capture metal chips.

Both tools can be used to find the root cause of the problem. For most problems to be permanently solved the root cause must be addressed. The fishbone diagram is a good visual tool that helps you understand all the areas that contribute to a problem.

Understanding all the contributing factors will help facilitate problem solving. The Five Whys will also help you move past dealing with the symptoms of the problem to solving the real problem.

Examples of the fishbone diagram and a Dear Abby letter are included as well as a blank fishbone diagram for your use.

The next tool will present brainwriting - a method to generate ideas.

Figure 1: Printing Process - Process Map

Process Map 3.0: Printing Press Process

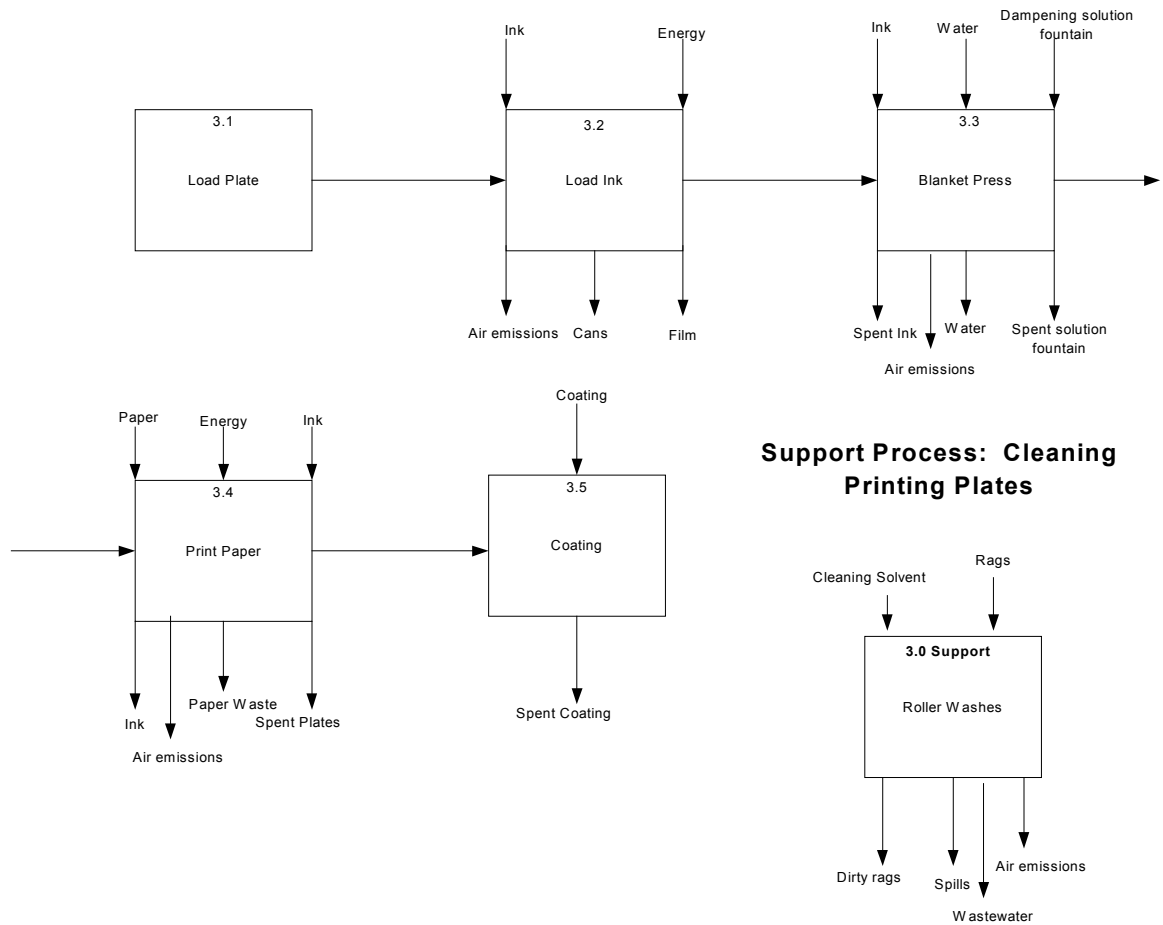


Figure 2: Cause and Effect Diagram

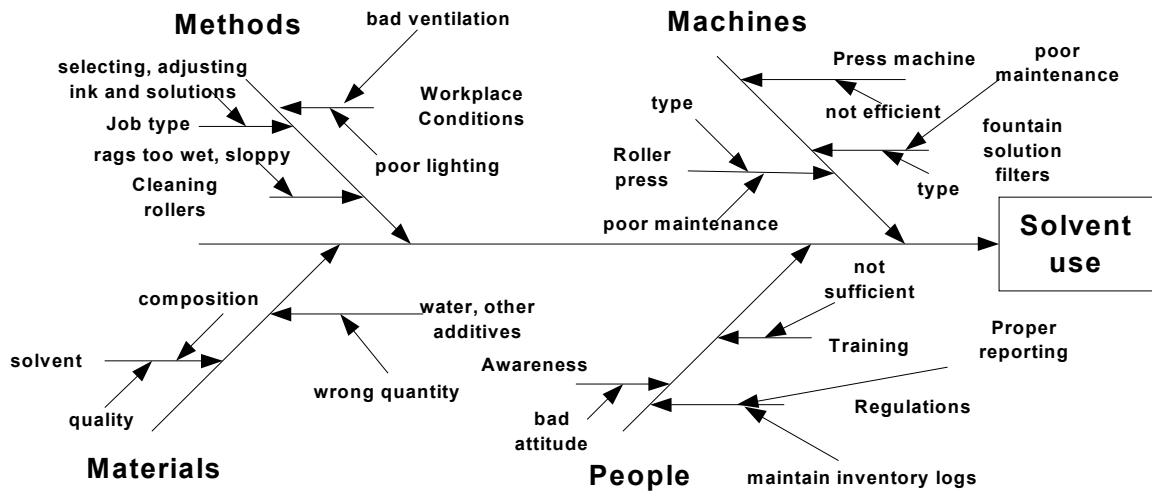


Figure 3: Dear Abby Letter

Dear Abby,

We run a small printing operation. Use of solvent is our most expensive business issue. Solvents are highly regulated and we must comply with lots of regulations from air quality to hazardous waste to health and safety. Some printing plants have had to pay lots of money for air quality permits, waste management and special equipment to meet regulations. These are issues that we wish to take seriously.

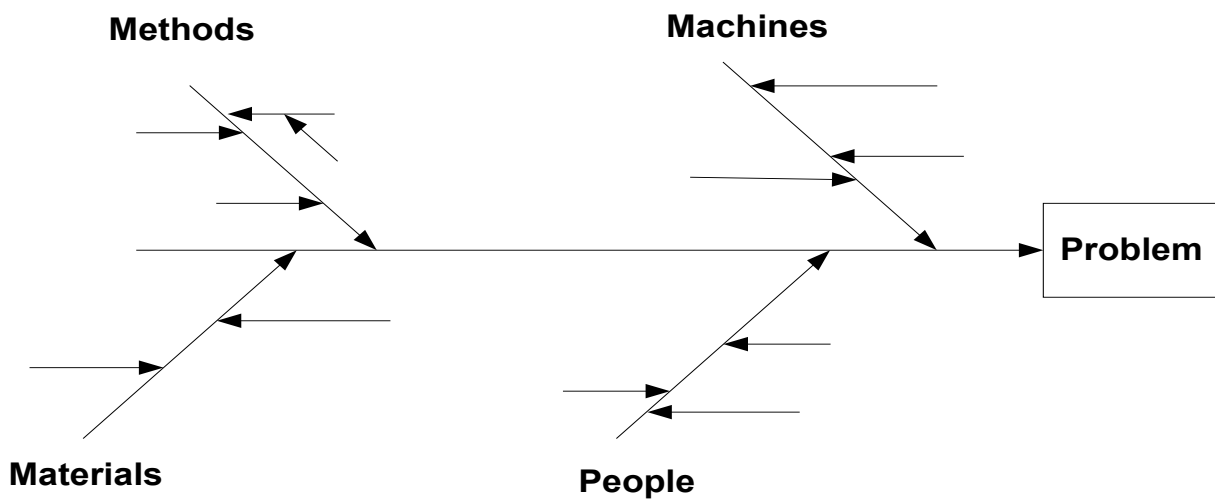
Our group did root cause analysis and we believe that our biggest problem is use of solvents. Employees affect solvent use from loading the ink, to maintaining the equipment, to keeping the presses clean and making sure we are in compliance with regulations. However, as you know, our employees have a billion things to do every day and they often don't stick around for enough time to get proper training.

Can you help us?

Signed,

Pressed for time in Albuquerque

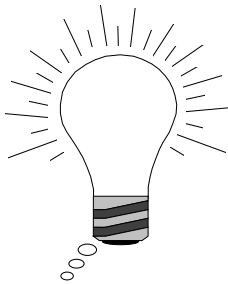
Figure 4. Root cause analysis: Fishbone Diagram



Tool #4: Brainwriting

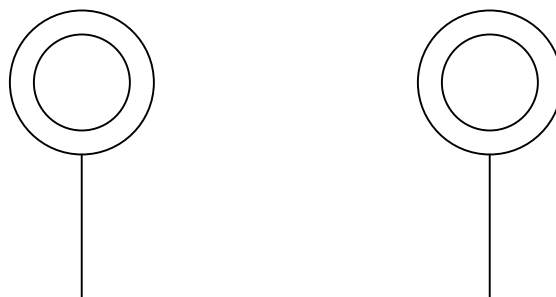
To address an opportunity effectively, it is important to recognize all alternatives. Very rarely is there one “right” way of preventing pollution. Instead, there are many different potential solutions. This tutorial presents a technique of listing many different alternatives for an opportunity.

Warm-up Exercise



You know the old adage “two heads are better than one”. This is especially true when trying to come up with new ideas. When you generate ideas in a group you will notice that each member of the group brings their unique set of experiences and strengths to the table.

Try the following exercise with your group. Look at the picture below (turn it on it’s side and upside-down). What does it remind you of? Write down all the images that come to mind-even images that seem crazy should be included. Now go around the room, each person sharing one image with the group. One person should volunteer to keep a list of all the images. Repeat this step until every member of the group is out of images. How many images did the group come up with? How does this compare with the number of images you generated alone?



Introduction

In the last tool you evaluated all the probable causes of a loss and determined the underlying reason, or root cause. Once the root cause has been identified, you may be tempted to jump to a premature solution. When you address a loss without considering all the alternatives of prevention you may be overlooking the most appropriate option(s).

Looking for alternatives for pollution prevention by addressing its root cause is the next step towards addressing an opportunity. There are several tools available to help groups develop alternatives. You already explored one tool during the warm-up exercise. In this exercise you will explore another method-brainwriting. Brainwriting requires maximum interaction and creativity between group members. The group should consider all possible alternatives, regardless of how far-fetched they appear to be. Alternatives raised by the group may seem contradictory, or they may build on one another making them better. A comprehensive list of alternatives can then be compiled.

During this exercise you will:

- Conduct a brainwriting session.
- Develop a list of all possible alternatives for an opportunity for improvement.

Brainwriting

First you have completed your process map to see how you can optimize your processes and reduce losses. (*see Figure 1*) In the example provided, Activity-Based Costing helped to identify that 80% of the environmental costs associated with printing was due to solvent use. Not only are solvents expensive, they are considered a hazardous waste and a hazardous air pollutant and they must be handled very carefully. Spills must be avoided to eliminate employee exposures and site contamination.

Root cause analysis determined that the greatest losses occurred due to employee handling practices. Employees control the printing processes from the beginning to the end and also must deal with environmental, health and safety compliance issues.

The next step is to develop as many alternatives to solve the problem as possible. This is done through the process of brainwriting. Through brainwriting, staff works together to generate as many alternatives as possible regardless of how crazy they seem. In fact, to make it more interesting you can give a prize to the person that comes up with the craziest idea.

Make copies of the blank brainwriting sheet included at the end of this chapter. Make enough sheets so that each person on the brainwriting team has one per person with one blank sheet in the middle of the table. Place these sheets in the center of the table. Each person should take a sheet and write two alternatives on it and then place the sheet back in the center. Then take another sheet of paper and write two more alternatives on it. Every time someone picks up a sheet of paper, encourage them to read what others have written and try to make improvements to the alternatives listed. Someone could even say they think someone's idea is completely out in left field, if they try to make it better. Keep repeating this process until everyone runs out of ideas.

Now list all the alternatives that were discovered.

The alternatives on each sheet of paper should be read aloud and discussed. Many of the ideas may be the same and some may have small variations. The group should debate the small variations and eliminate the impossible alternatives. One comprehensive list should be developed-each idea only written once, although all variations of the same idea should be included.

Examples of brainwriting are provided below.

The next tool will present 'bubble-up-bubble-down'...a method for selecting the best option to prevent loss.

Figure 1: Printing Process Map

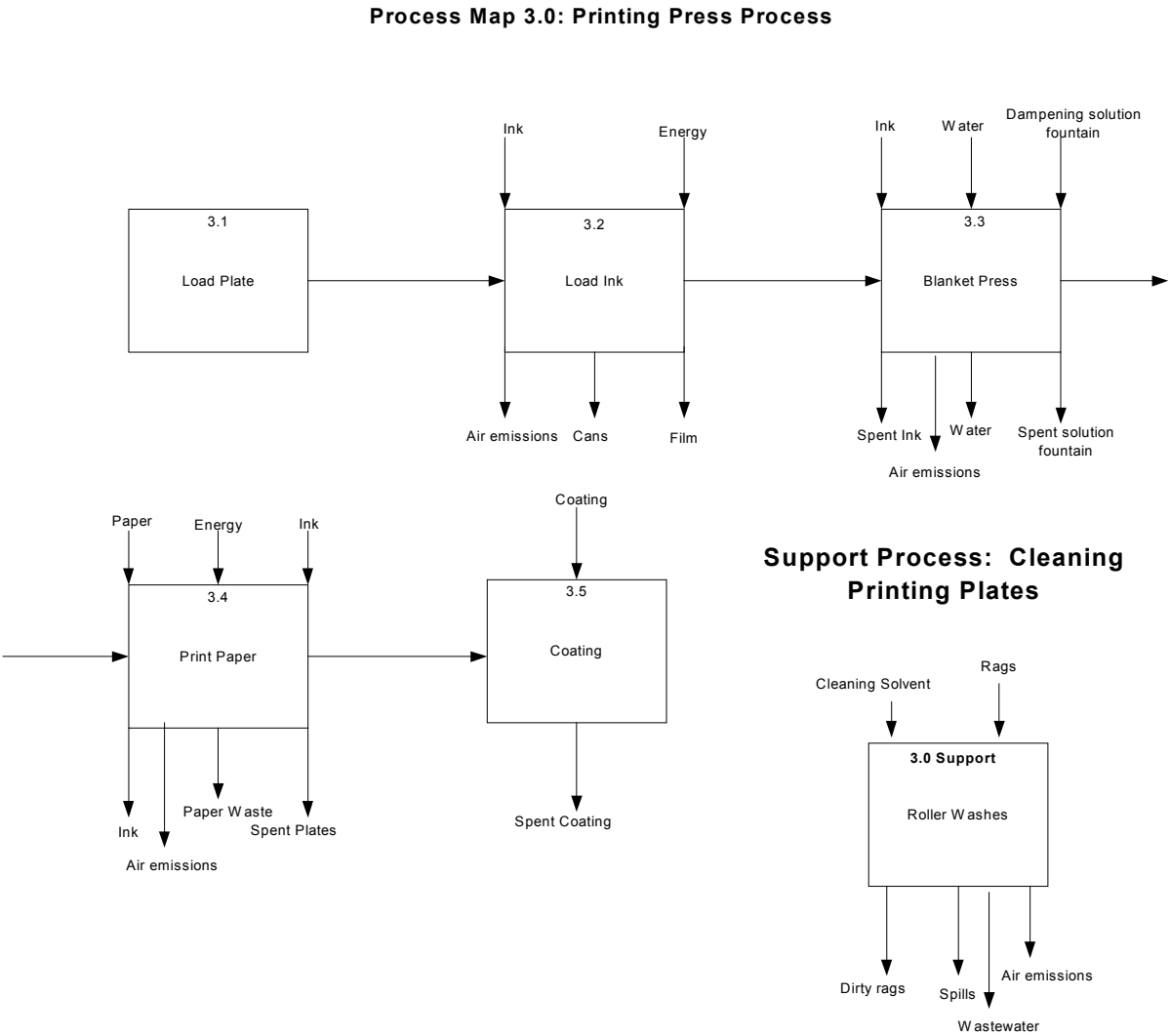


Figure 2: Sample of brainwriting

1. Use non-toxic solvent to eliminate all environmental problems.	2. Train people to maintain filtration system better.
3. Employees could use a centrifuge to remove liquid solvent from rags before sending off for cleaning.	4. Investigate alternative printing systems.
5. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.	6. Begin an employee incentive program to reward best operating practices for operating printing machine and reduce loss from rejects and excessive solvent use.
7. Start an energy conservation program and focus on presses.	8. Institute a program to use less solvent in all cleaning operations...less solvent on the rags to clean, less solvent in the fountain solutions.
9. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.	10. Test solvent to see if we are replacing too soon.

Figure 3: List of alternatives

1. Use non-toxic solvent to eliminate all environmental problems.
2. Train people to maintain filtration systems better.
3. Purchase a centrifuge system to remove liquid solvent from rags before sent off for laundry.
4. Investigate alternative printing systems.
5. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
6. Begin an employee incentive program to reward best operating practices for operating presses to eliminate rejects and reduce solvent use.
7. Start an energy conservation program and focus on presses.
8. Institute an employee program to use less solvent in all areas...less on rags, less for cleaning, less in operations.
9. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
10. Test solvent to see if we are replacing too soon.

Figure 4: Brainwriting Sheet

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

Tool #5: Bubble Up-Bubble Down

You have now generated a list of alternatives for preventing an environmental loss in your business. But how do you choose the best alternative? This tutorial presents one method of prioritizing alternatives to ensure that the most appropriate alternative is selected.

Warm-up Exercise



Most of us use lists from time to time to make sure that we don't forget to do the things that we need to get done. Without a shopping list, for example, we may return from the store without milk, the reason why we went in the first place. Certain limitations, like time or money, may cause us to drop things off our list. We often need to prioritize and make sure that the most important things get done.

Make a list of the things that you need to get done tomorrow (try to list at least ten things). List these items in the order that they come to mind. Now prioritize this list by putting the most important items on the top of the list and the least important items on the bottom. You should now have a "rank ordered" list. If you only have time to complete one of the items on your list, which would it be? You should have answered the item on the top of the list the most important item.

Introduction

A comprehensive list of pollution prevention alternatives was developed in the last tool using a technique called brainwriting. The alternatives generated during this tutorial can range from operational changes, such as employee training and improvements in operations, to technology changes, such as changing a solvent. The next step is to choose one alternative that is capable of being worked with successfully. Additionally, it is important to select the optimal solution for your business. To accomplish this, you must consider the *feasibility* of each alternative. Such factors as effectiveness, implementability, cost, and potential ramifications of each alternative should be discussed. Personal preferences and biased information should not enter into the decision-making process.

There are several tools available to aid a group in selecting an alternative and avoid bias. These tools allow a group to rank and prioritize alternatives using a systematic approach. When all the alternatives are listed, suggestions are made by the group to improve even the worst alternatives. At this point, many of the alternatives may be eliminated: every realistic alternative remains on the list. These remaining alternatives can then be sorted based on the factors presented above and any other factors that may effect a particular business. The method of selection presented in the exercise is the bubble-up-bubble-down. This tool uses a forced pair comparison to rank alternatives. Using this method you will be able to find the most effective solution to the selected loss.

During this exercise you will:

- Evaluate all alternatives.
- Use the bubble-up-bubble-down method to reach a decision on the best alternative.

Bubble-Up, Bubble-Down

Take the list of alternatives and compare the first two alternatives. Decide which of the two is the best and move this alternative to the top of the list. Go to the next, or third alternative and compare it to the second. If it is better than the second, move it up and compare it to the first, if not, leave it in the third position. Continue this process until all the alternatives are rank ordered. This process should go fairly quickly. Make sure you listen to everyone's opinions and objections. Again, factors to consider are cost, effectiveness and the ability to implement the alternative.

Bubble-up, Bubble-down should generate much discussion among employees on the best solutions. These discussions will help to increase buy-in to the alternatives. As a rule, employees never resist their own ideas.

An example of how the Bubble-Up Bubble-Down method was applied to the list of alternatives generated in the last tool are listed below.

Typically, the three or four alternatives that “bubbled-up” to the top of the list are the easiest and cheapest to implement, the “low-hanging fruit”. The alternatives in the middle may require more research or study to see if they are feasible. The ideas at the bottom of the list may require major equipment changes or capital investments. It is important to keep the entire list on file as part of your continuous environmental improvement program.

The next step is to develop an action plan. Action planning is essential to assure that ideas are implemented!

Figure 2: List of alternatives, prioritized through Bubble-Up, Bubble-Down

1. Begin an employee incentive program to reward best operating practices for operating presses to eliminate rejects and reduce solvent use.
2. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
3. Institute an employee program to use less solvent in all areas...less on rags, less for cleaning, less in operations.
4. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
5. Purchase a centrifuge system to remove liquid solvent from rags before sent off for laundry.
6. Train people to maintain filtration systems better.
7. Start an energy conservation program and focus on presses.
8. Use non-toxic solvent to eliminate all environmental problems.
9. Investigate alternative printing systems.
10. Test solvent to see if we are replacing too soon.

Tool #6: Action Planning

Being able to successfully manage a project is important when trying to accomplish a task, especially when you are under a deadline. You need to set up a schedule, ensure that you have the necessary resources, and assign the right person to each part of the job. In this tutorial you will create an “action plan” for the implementation of an alternative to prevent pollution.

Warm-up Exercise



Your group has been assigned the task of making chocolate chip cookies. The cookies need to be ready in one hour and the cooking time is twelve minutes. Pick a person to manage this project. The manager must then assign the ten tasks listed below to individuals in the group.

You will need to know how much time is required for each task, what tasks need to be accomplished before others, what resources (i.e. bowls, flour etc.) are required, and what the most efficient way of organizing these tasks (and remember the clock is ticking). Create a schedule.

Making chocolate-chip cookies:

- Mix dry ingredients
- Mix wet ingredients
- Put the batter on the pan and put pan into the oven
- Combining wet and dry ingredients
- Turn on the oven
- Taste cookies
- Wash tools and utensils
- Grease pan
- Take cookies out of the oven

Developing an Action Plan

Before you begin to implement your alternative you should complete this questionnaire. It will ensure that you are being thorough in your planning and have considered all the important issues that may arise such as the resources that are needed and the problems that may occur. (see Figure 2)

Things to consider in developing an action plan are resources needed, both financial and human resources; the need for pilot testing or bench scale testing; information sources from the outside such as trade associations, vendors and suppliers and the Environment Department. Other issues such as employee support and maintaining product or service quality should be considered. A list of questions that should be considered during action planning is as follows:

Action Planning Questionnaire

1. What is the overall objective and ideal situation?
2. What steps are needed to get there from here?
3. What actions need to be done?
4. Who will be responsible for each action?
5. What is the best sequence of action?
6. How long will each step take and when should it be done?
7. How can we be sure that earlier steps will be done in time for later steps that depend on them?
8. What training is required to ensure that all staff have sufficient know-how to execute each step in the plan?
9. What standards do you want to set?
10. What volume or quality is desirable?
11. What resources are needed and how will you get them?
12. How will you measure results?
13. How will you follow up each step and who will do it?
14. What checkpoints and milestones should be established?
15. What are the make/break vital steps and how can you ensure they succeed?
16. What could go wrong and how will you get around it?
17. Who will this plan affect and how will it affect them?
18. How can the plan be adjusted without jeopardizing its results for the best response and impact?
19. How will you communicate the plan to generate support?

Now put all this information in an Action Plan Form. Most of the information you need should come from your answers to the questionnaire. The specific task, or step, to be accomplished is written in the first column under "Action." In the following column list the person who is responsible for completing this task. A performance standard should then be provided. This standard is a way of establishing how well a task needs to be performed.

Under “monitoring technique” enter a measurable goal or target used to track the plan’s implementation. A firm deadline should then be set, and finally, indicate the resources that are needed to perform each task. This form will help you organize your thoughts, keep track of all the actions that need to be completed, and ensure that the proper quality is being maintained.

Use the form provided to track implementation of the project and to measure its success. A sample action planning form is included at the end of this section.

Overall Target: Employee Incentive Program					
Action	Responsible person	Performance standard	Monitoring technique	Completion deadline	Resources needed
1. Develop Program incentives	Carol	List of incentives	Discuss ideas with Marge the owner	Jan 15	Team of Carol and Mark
2. Design a program for review and giving incentives	Marcy	Approved program by Marge	Marge approves, allocates funding.	Feb 1	Action #1 complete
3. Meet with employees	Carol, Mark and Marge	Highly interactive meeting	Question employees before and after	Feb 15	Firm date for meeting; meeting room
4. Set up improvement/suggestion box, system	Carol	System in place, all employees are aware, easy to use	Number of ideas submitted	March 1	Box, access to company computer, review team
5. Review Team	Carol and Mark	Review team reviews suggestions monthly	Marge evaluates work	March 7	Ideas accepted/implemented
6. Incentives awarded	Marge	Ideas implemented, paying off in \$\$, improvements	Check on progress, success	June 1	Cash bonuses, days off, etc

Congratulations!!! You have completed the Pollution Prevention Training. Now it is time to put these tools to work and remember pollution prevention is an ongoing process. If you continue to implement pollution prevention in your business, you will increase the efficiency of your process while helping the environment. Simply revisiting your process maps and Pareto Chart once a year and using the tools to continue to make improvements will make a big difference in your operation. Ongoing use of these tools will help you to participate in the Green Zia Environmental Excellence Program.

Here are a few suggestions to make pollution prevention continue to work for you:

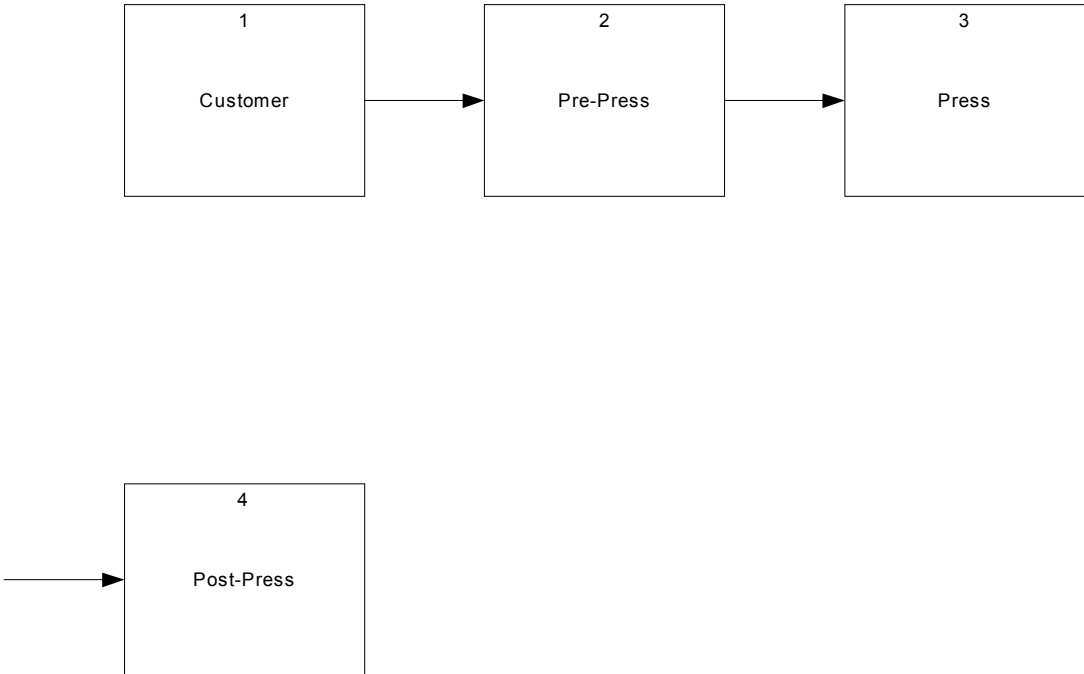
- Return to the Nothing to Waste activities and concepts as you make environmental improvement decisions.
- Schedule regular pollution prevention reviews of your business.

Remember: Pollution Prevention saves resources, saves money, and prevents accidents!

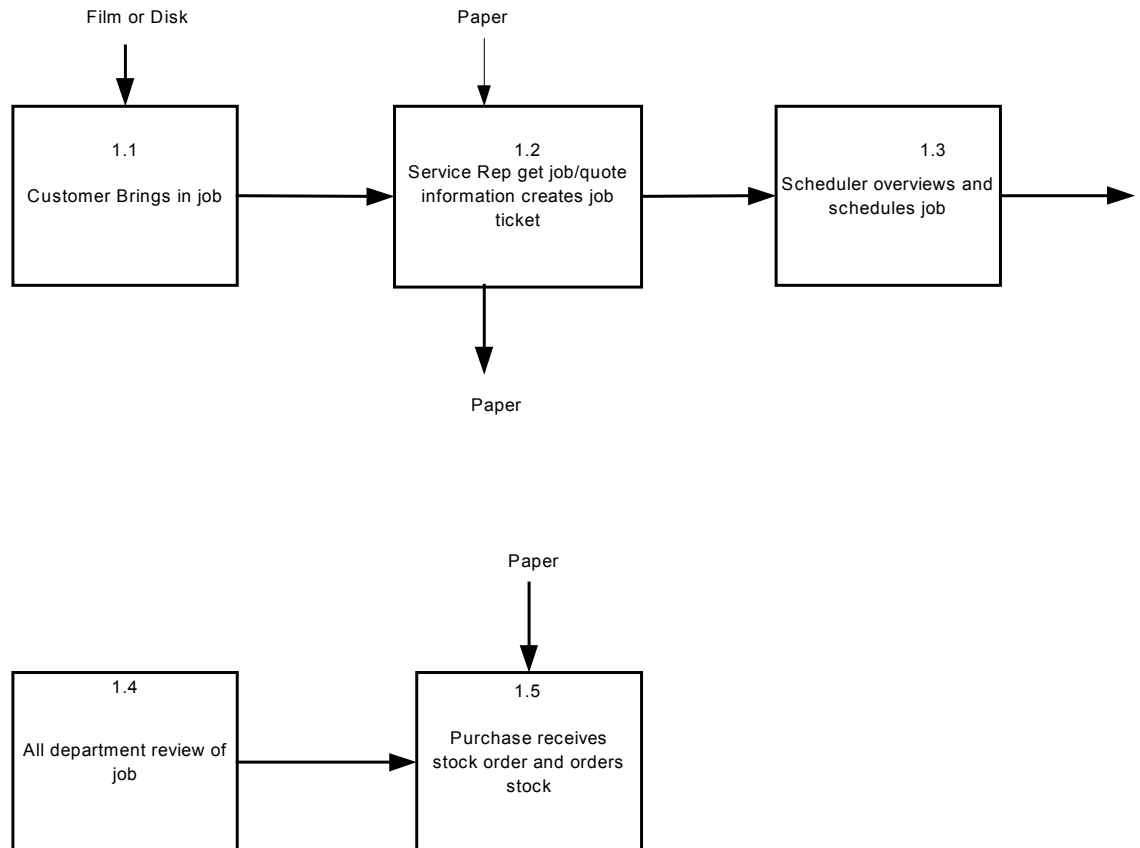
Overall Target					
Action	Responsible person	Performance Standard	Monitoring Technique	Completion Deadline	Resources Needed
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Process Maps for Printing

General Process Map for Lithography Printing



Map 1.0: Process Map for Customer



Customer 1.0

1.1 Customer Brings in Job

The customer brings the job to the printing company on disc or film. The customer has the design already finished and wants the design printed at the printing company.

1.2 Service Representative gets Job

The service representative gets the job and quotes information about that job. He/she also creates the job ticket for that job.

1.3 Scheduler Overviews and Schedules Job

The scheduler gets the job, overviews it, and schedules the job. This includes scheduling the stock order for the necessary supplies to do the job. If the job requires outside work, such as binding, envelopes, cutting thick paper, etc., the scheduler will schedule contractors to do this after the job is printed.

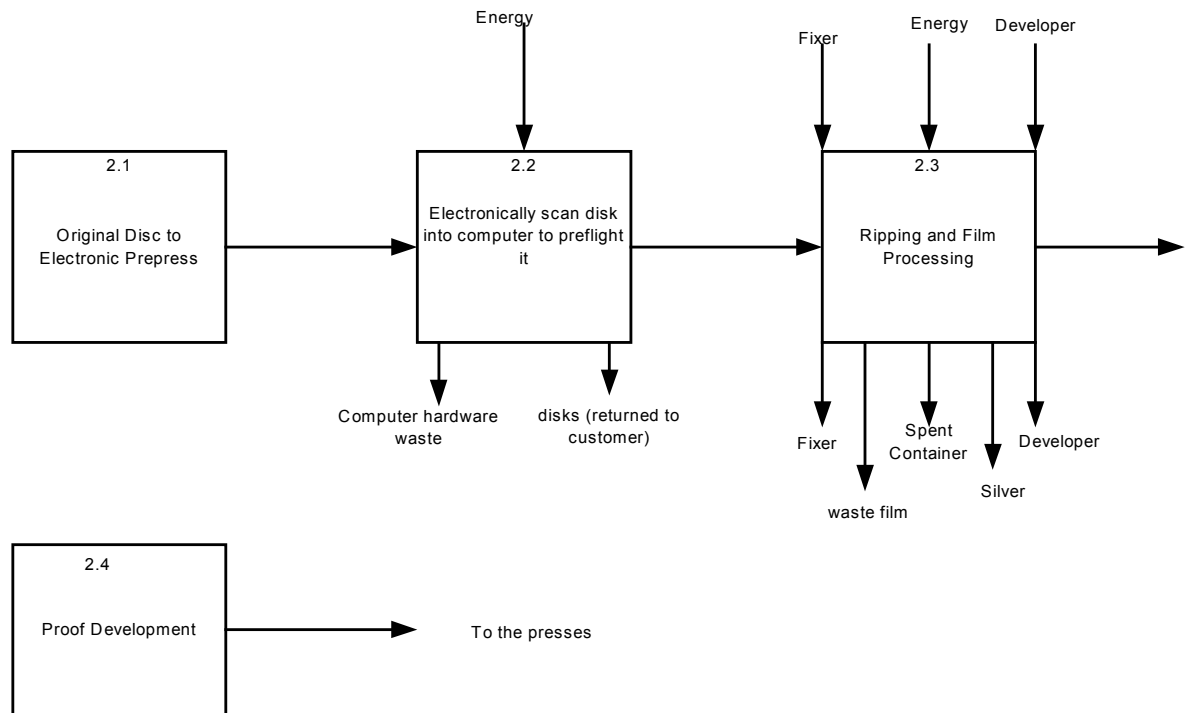
1.4 Purchase department Receives Stock Order

During this process, the purchase department receives the stock order and orders the stock. Paper choices include virgin paper, recycled paper, chlorine-free paper and kenaf.

1.5 All-Department Review of the Job

The department reviews the job to decide if there are any problems with the job and if the supplies are ready to go.

Process Map 2.0A: Pre-Press



Pre-Press 2.0

2.1 Original Disc is Taken to Electronic Pre-Press

The original design is taken into the computer run to be electronically examined.

2.2 Electronically Scan Disc

The disc is pre-flighted (make sure format is correct and there is no viruses).

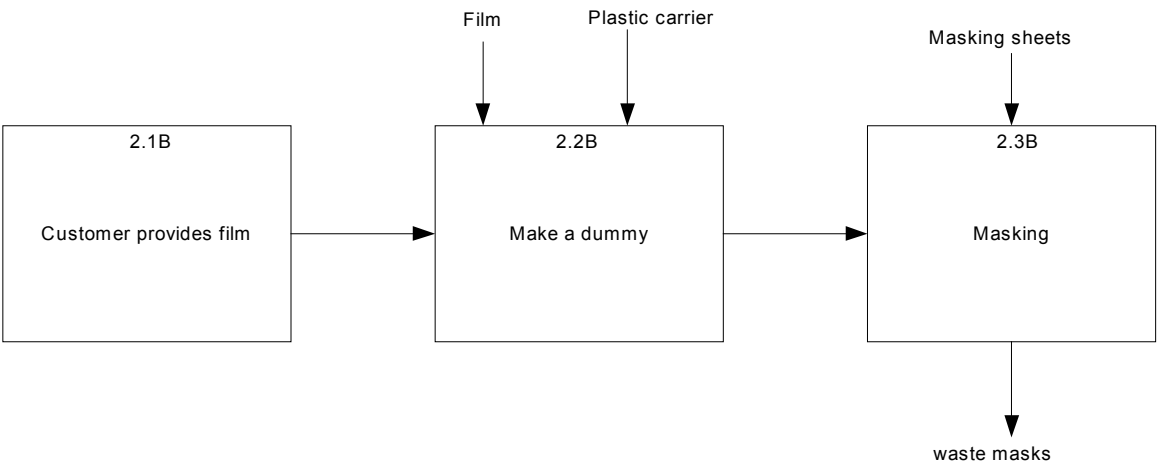
2.3 Computer File Taken to Sci-tex Machine

The computer file is taken to the Sci-tex Machine to print out file onto film. While the machine prints the file onto film fixer and developer removes the silver from the film. This step creates fixer, developer, and spent containers.

2.4 Water Proof Film

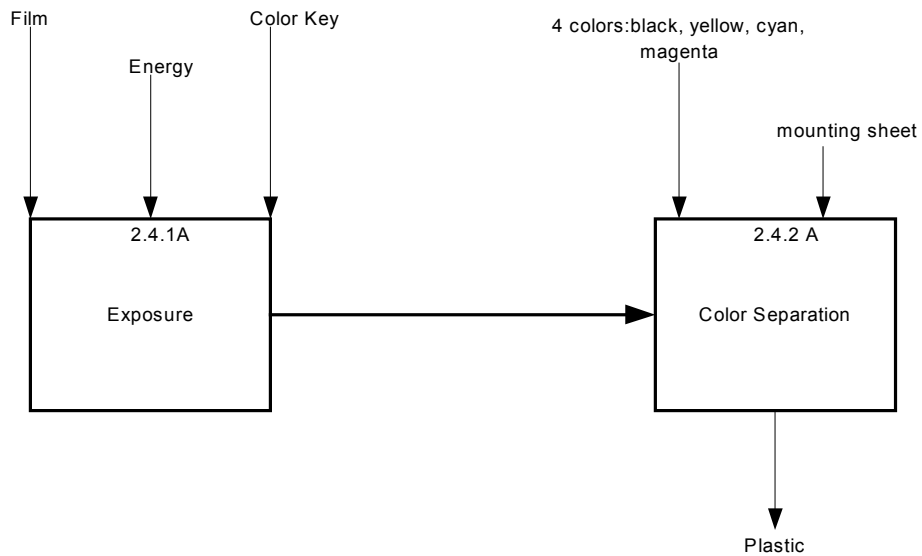
Film is put on a transfer sheet and water proofed so the customer can see the design before it is plated.

Process Map 2.0B: Traditional Prepress

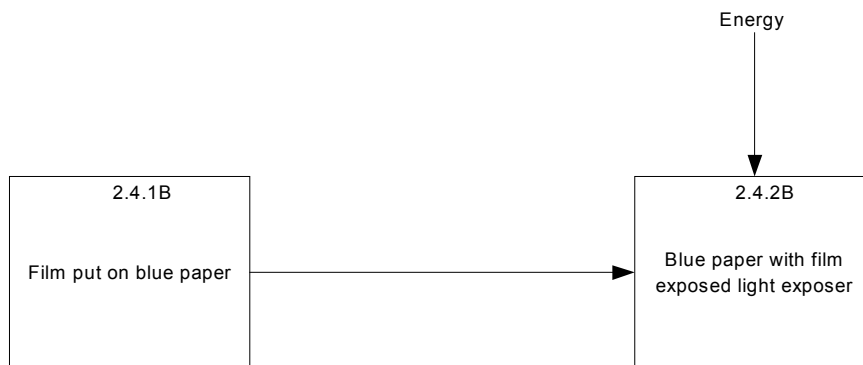


No narrative prepared for this process.

Process Map 2.4.1A: Color Key Process for Proofing

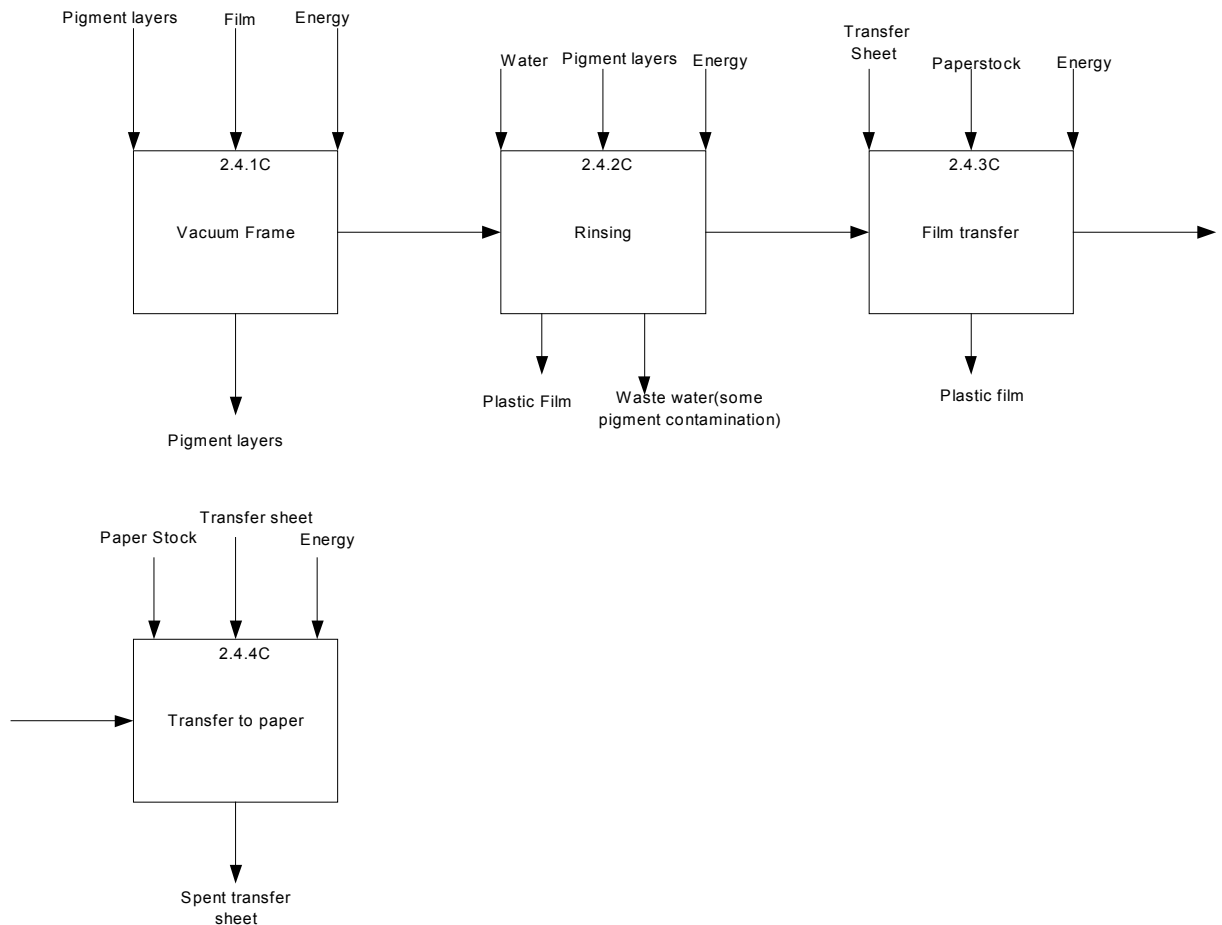


Process Map 2.4.1B: Blue Line



No narratives prepared for these processes.

Process Map 2.4 C: Water Proofing



2.4 C Water Proof Development

2.4.1C Film to Vacuum Compressor

The film goes through a vacuum compressor that will put the image onto colored sheets. This set requires the usage of colored sheets, vacuum oil and energy. The waste created in this step is colored sheets, spent vacuum oil, and fixer and developer vapors.

2.4.2C Water Proofing Machine

The colored sheet is put through a waterproofing machine that will separate the colors by water and create the actual image onto the sheet. This process requires the usage of water and energy and generates water waste.

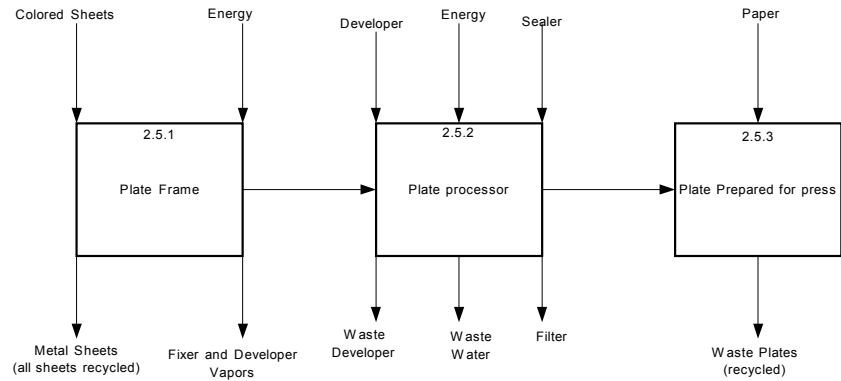
2.4.3 Transfer image to transfer Sheet

The water proofing machine transfers the image onto an adhesive transfer sheet. This process uses energy and generates adhesive transfer sheet waste. The sheets may be recycled.

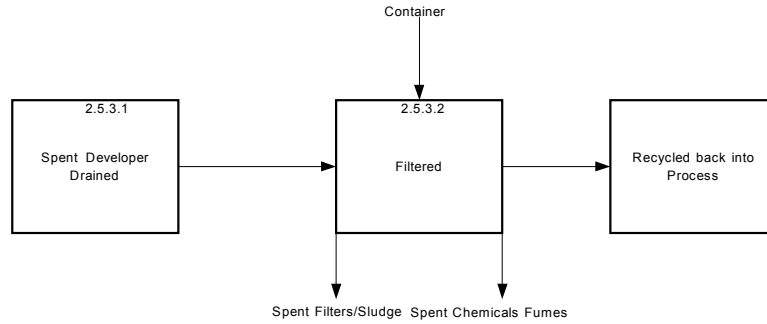
2.4.4C Transfer Sheet Given to Customer

The transfer sheet has the desired image and is given to the customer for approval. If the customer approves, the image will be redone onto a plate. If the customer wants edits done to the image, the image will be edited and once again placed onto a transfer sheet.

Process Map 2.5: Prepress Plate Making



Support Process Map for 2.5.3: Developer Reclamation



Narratives on next page.

2.5.0 Plate Making

2.5.1 Film Taken to Vacuum Compressor

The film is taken to a vacuum compressor that will place the image onto a transfer metal sheet. Material use includes colored sheets and energy. Losses include metal sheets (although it may be recycled) and fumes from fixer and developer.

2.5.2 Plate Processing

The plate moves through the plate processor. The plate processor removes photo polymer by spraying developer on the plate. The plate is then scrubbed to remove the remaining photo polymer. The plate is coated with a thin layer of plastic. Material use includes developer, energy and coating plastic. Losses include spent developer, waste polymer, energy and plastic.

2.5.3 Image on Plate

The finished result is the image is now on the plate and ready to be printed. This step generates spent plate waste (may be recycled).

Support Process for 2.5.3: Developer Reclamation

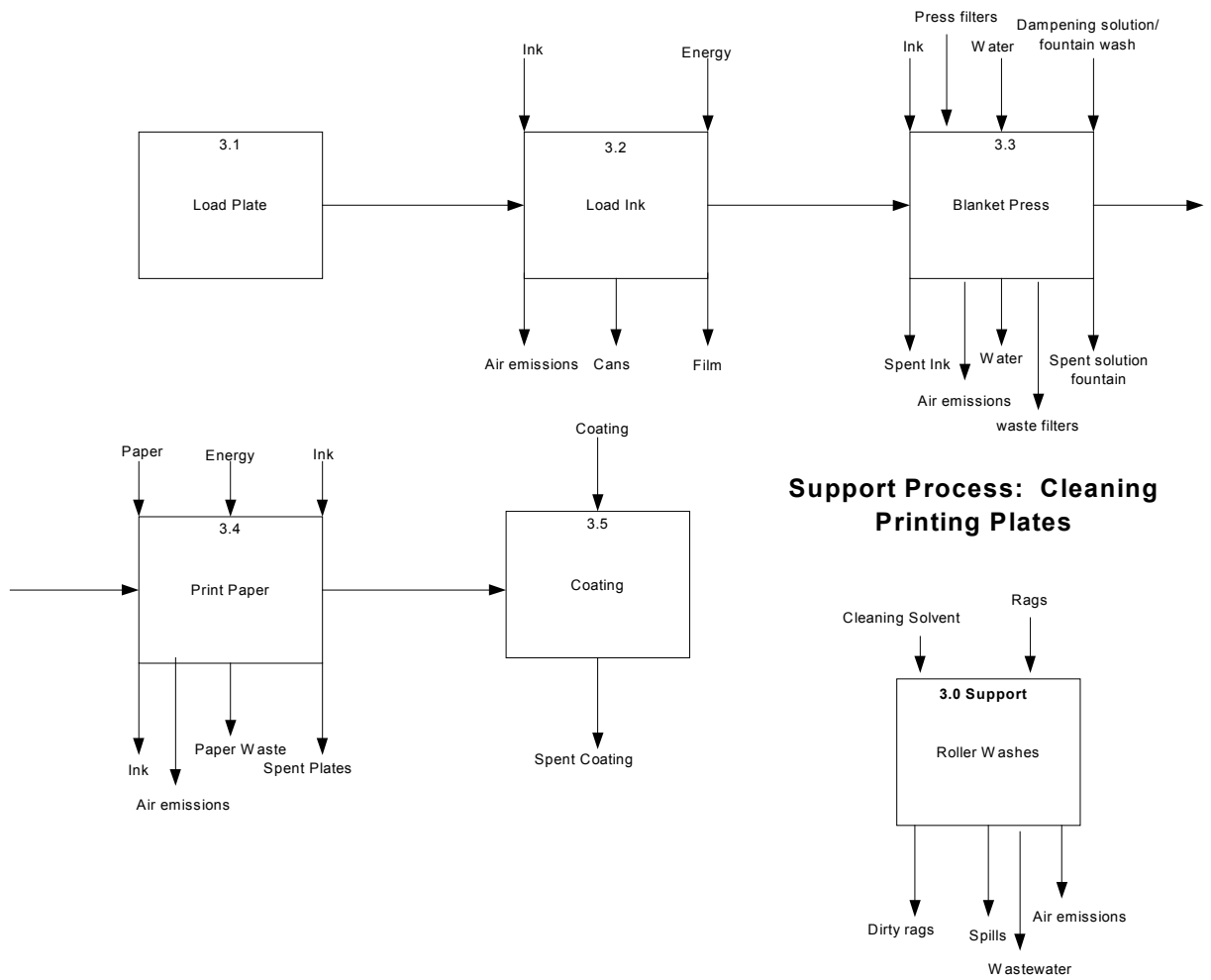
2.5.3.1 Developer Reclamation Unit

The spent developer is reclaimed through a reclamation unit, which is a filtration unit. Filtered developer is recycled back into process.

2.5.3.2 Chemicals to Waste Hauler

The waste materials from the reclamation unit are barreled and managed by a certified waste hauler.

Process Map 3.0: Printing Press Process



Process Map 3.0: Press Operations

3.1 Load Plate

The plate is placed into the blanket rollers of the press.

3.2 Load Ink

This step requires the usage of ink, solvents to thin ink, Polyamide Resin, metal foil and energy. Losses include solvent vapors, ink, Polyamide Resin, and metal foil.

3.3 Blanket Press

The blanket rollers place the ink onto the plate. This process uses ink and dampening fountain solution. The waste generated includes spent ink and fountain solution. Fountain solution is discharged to sewer if it is non-hazardous waste.

3.4 Print

This step is where the color image is printed onto large sheet of paper. Once printed, the finished pile is taken to the back for folding and cutting. This step uses paper, energy and ink. The waste create include ink, paper waste, and spent plates. All paper, ink and plates may be recycled.

3.5 Apply Coating

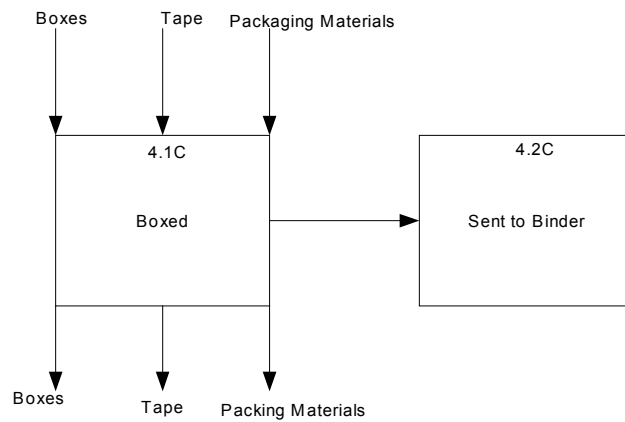
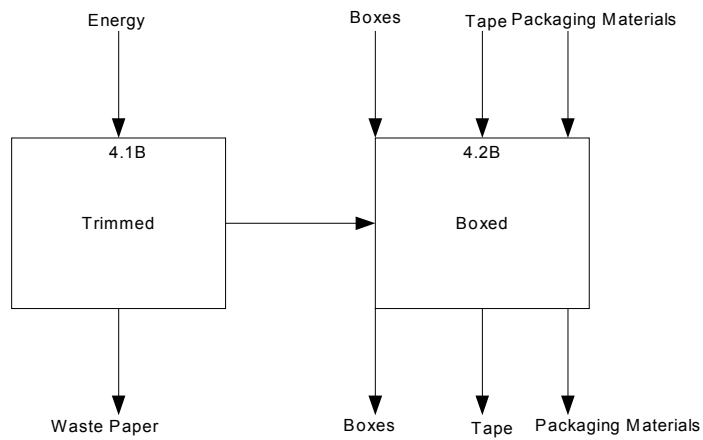
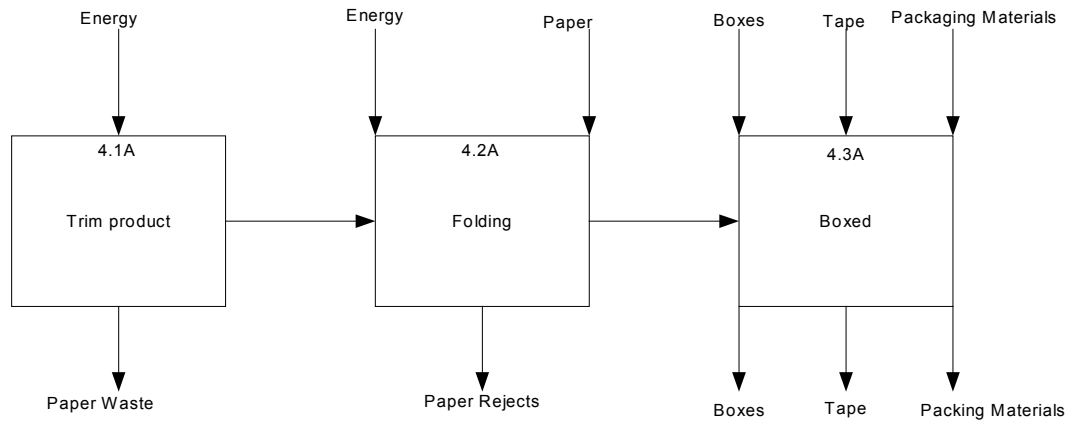
A final coating is applied upon request from the customer. Waste coating is generated through this process.

Support Process 3.0 for Press Operation

3.0 Roller Washes

Rollers require washing to remove ink. Solvent is typically used to clean rollers. Losses include red rags soaked in solvent, solvent vapors, spill clean-up materials. Fountain solution is discharged to sewer if it is not hazardous.

Process Map 4.0: Post-Press Operations



Process Map 4.0: Post-Press Operations

4.1 Product Folded

The product is trimmed and then a folding machine folds the finished product. All waste paper may be recycled. Process also uses energy.

4.2 Product Cutting

Paper is cut to size depending on job specifications. This step requires energy to run the machine. Paper waste is created in this step and may be recycled.

4.3 Finished Process is Boxed and Shipped

The finished product is boxed and shipped to either the customer or to a bindery company for binding, and cutting. This process requires the usage of boxes, tape, and packaging materials. This step generates boxes, tape, and packaging material waste.

Printing Regulatory
Guidance, Pollution
Prevention Information and
other Resources

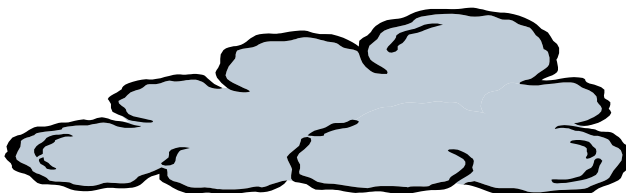
Understanding Solvents: Common Uses and Chemical Composition

Eliminate - Reduce - Reuse - Recycle - Exchange

Solvents are used to create a fluid environment in which reactions or processes can be run efficiently and effectively. Solvents influence pH and temperature factors that affect the binding mechanisms of soiling agents. The following paragraphs are intended to serve as an introduction to the **chemical composition**, **general activity mechanisms**, and **common uses** of various types of solvents.

Petroleum-Based

This group refers to a class of solvents that are used as **general-purpose cleaners**. Most petroleum-based solvents consist of a hydrocarbon “backbone” to which chemical functional groups and oxygen groups have been added. In these solvents, the inorganic functional groups are responsible for the activity of the solvent. The exception to this rule is a subclass of petroleum-based solvents called aromatic and aliphatic hydrocarbon solvents, which contain multiple bond arrangements and/or are bonded into ring confirmations. In these solvents, it is the carbon confirmation and arrangement of double and triple bonds between neighboring carbon atoms that give the solvent its activity.



Industry has chosen the petroleum-based solvents with low molecular weight, which have **high volatility**. The high volatility and reactivity of these solvents allows **maximum removal of soils** and contaminants, creating compatibility with varied work surfaces and subsequent process requirements while simplifying process and technique, thereby **minimizing costs**. Furthermore, because many soiling agents are organic compounds, ex.) grease, motor oil, waxes, and most

lubricants, they are miscible in organic petroleum-based solvents, allowing for **quicker, more effective clean up**.

Due to their **high volatility**, total containment of petroleum-based solvents during application and waste storage is nearly impossible. The **atmospheric escape** of these solvents, many of which are classified as Volatile Organic Compounds (VOC's), has been shown to contribute to **stratospheric ozone depletion, air pollution through smog formation, and soil and groundwater contamination**.

Types of Petroleum-Based Solvents:

Halogenated petroleum-based solvents:

These solvents consist of the **highly reactive** functional groups chlorine, fluorine, or bromine. These halogens share the same number of electrons available to participate in chemical reactions. For this reason, the chemical reactivity of these solvents is less dependent on which halogen atom comprises a functional group than on how many functional groups are attached to the hydrocarbon “backbone,” a number referred to as the **degree of halogenation**. A solvent with a high degree of halogenation has a **high volatility** and **strong cleaning properties**.

Higher energy levels in the bonds make the molecule more reactive, which can cause it to escape from the liquid phase into the gas phase and enter the atmosphere. The popularity of halogenated solvents arose from their **superior contaminant and soil expulsion properties, low flammability, compatibility with work surfaces** and process equipment, and **relatively low cost**.

Alternatives that Reduce Risk:

Though it is often advisable to seek non-halogenated alternative solvents because halogenated compounds are hazardous to human and environmental health, several new halogenated alternatives have been developed with short atmospheric lifetimes.

- **n-Propyl Bromide:**

Many commercial “green” solvents have replaced their chlorinated solvents with **n-butyl** bromide because it is a nonflammable VOC with a 10-11 day atmospheric lifetime, giving it a **low Ozone Depletion Potential**. However, despite a low bio-accumulation potential, **n-butyl** bromide solvents are **non-biodegradable**, and in large volumes have the potential to penetrate soil and **contaminate groundwater**. Furthermore, they may **harm** some work surfaces, especially aluminum surfaces.

High-volatility oxygenated solvents:

In these solvents, the halogen functional group is replaced by an oxygen group such as a hydroxide group, such as alcohols; an ethyl group, such as ethers and esters; or a carbonyl group, such as ketones, aldehydes, and carboxylic acids. The hydroxide group has a similar chemistry to the halogen groups with one important exception: most of the oxygenated solvents are **highly flammable** and therefore **restricted** to applications such as ambient temperature immersion and manual wipe.

Oxygenated solvents are also prone to undergo reduction/oxidization (redox) reactions, which is the addition or elimination of double bonds or oxygen atoms. Although redox reactions in these solvents rarely result in more **toxic compounds**, the resulting solvent is **less effective** and **more flammable** under atmospheric conditions. For this reason, a warning not to mix with oxidizing agents often accompanies the oxygenated and aromatic and aliphatic hydrocarbon solvents.

Alternatives that Reduce Risk:

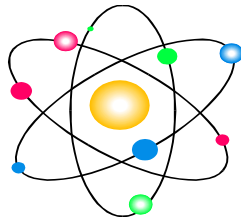
- **Acetone:**
Excluded from the U.S. EPA's definition of VOC's due to its insignificant reactivity in the presence of sunlight, Acetone is a nonetheless a **highly volatile organic solvent**. Acetone is suitable as a drying agent and for ambient immersion or manual cleaning applications of soils such as greases, waxes, and inks. Due to its **high flammability**, safety cautions must be implemented during handling as well as during recycling. Although Acetone need not be reported under SARA 113, it is on the RCRA list of **hazardous wastes**, and must be **incinerated** for disposal.
- **Alcohols (with perfluorocarbons):**
Alcohols, mainly isopropanol, methanol, and ethanol, are excellent cleaning solvents for certain soils. The hydroxide functional group allows the alcohol to exhibit some of the same properties as water, while the hydrocarbon "backbone" allows the alcohol to dissolve low-molecular-weight oils. Alcohol solvents are often **biodegradable and water-soluble**. Alcohols are also **flammable VOC's** and as a result can only be used directly in manual and cold immersion applications, although their greatest efficacy occurs in heated or boiling liquid applications.

This obstacle can be overcome by placing a perfluorocarbon vapor "blanket" above the heated cleaning system. This vapor "blanket" shields the solvent from atmospheric oxygen that causes combustion. Perfluorocarbons are **nonflammable**

and have **low toxicity**, but are **costly** and have **high global warming potential**. Though they are immiscible in alcohol and easily separable and reusable, the capital and operational costs of perfluorocarbon systems are fairly high and prohibitive when other methods are available. Perfluorocarbons, which can be employed as solvents alone, have greatest potential in cleaning equipment that uses fluorinated lubricants or polymeric and elastomeric materials that are easily corroded by other solvents.

- **Glycol Ethers/ Ethyl Lactate:**

Because glycol ethers **emulsify well and separate easily**, they are prime candidates for the organic components of semi-aqueous solvents. They are also being substituted for both harmful halogenated hydrocarbon and high-volatility oxygenated solvents in capacities ranging from **dry cleaning to degreasing**. Often azeotropic blends and additives such as isoparaffinic hydrocarbons are supplemented in to increase the solvent's efficacy rating, work surface compatibility, and/ or decrease the solvents flammability. However, glycol ethers are **highly flammable VOC's**.



Commercially important glycol ethers have been separated into **two categories**: the E-series, or ethylene glycol ethers, and P-series, or propylene glycol ethers. Because they have been linked to **miscarriages**, SARA 113 and OSHA heavily regulate the E-series. Due to these concerns, alternatives are being researched.

- **n- Methylpyrrolidone (NMP):**

NMP is a **combustible VOC** listed under the SARA 113 Title III. Despite this listing, NMP is **very useful** in removing high-molecular-weight greases and carbon deposits as well as coatings (polyurethane, ink, and resin), enamels, and many plastics. It can be employed in both immersion and ultrasonic processes. Since many oils are only soluble in NMP above 145 F°, oil soils can be easily separated and the **solvent reclaimed** by lowering the solvent temperature. Furthermore, NMP is **biodegradable** and can also be reclaimed through separation and subsequent vacuum distillation.

Aromatic and aliphatic hydrocarbon solvents:

These solvents are also referred to as unsaturated hydrocarbons. Due to their flammability concerns and redox potential, aromatic and aliphatic hydrocarbon solvents share the advantages and disadvantages of the oxygenated solvents.

Alternatives that Reduce Risk

- **Terpenes:**

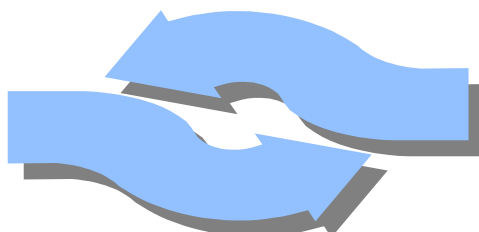
Derived from natural sources such as citrus fruit and pine trees, terpenes are **biodegradable** and are **useful** in semi-aqueous solutions (from which they can often be **separated and reused**). Terpenes are **flammable VOC's** and very **strong cleaners**, removing resin, fingerprints, and high-molecular-weight greases. They can be used in ambient immersion and ultrasonic applications, though they may be too strong for some work surfaces.

- **Petroleum Distillates:**

Produced from crude oil cracking, petroleum distillates are also **flammable VOC's** used to remove high-molecular-weight greases, tar, and waxes in immersion or manual applications. This class of solvents includes mineral and white spirits, naphtha, kerosene, and Stoddard solvent, which **vary in cost and toxicity**. Petroleum distillates are able to penetrate and clean porous surfaces, and **evaporative losses can be minimized** through the use of a paraffinic hydrocarbon additive. Furthermore, they can serve in some semi-aqueous solutions, from which they can be **easily reclaimed** through separation or distillation techniques.

Aqueous Solvents

Aqueous solvents are a category consisting mainly of **water and dissolved inorganic water soluble components** such as surfactants, chelating agents, emulsifiers, sequestering agents, and corrosion inhibitors. Water is a polar compound, meaning that a portion of the water molecule, the oxygen atom, has a greater affinity for the



molecule's bonding electrons, and hence has a slight negative charge. As a result, the remaining portions of the molecule, the hydrogen atoms, have a slight positive charge. Due to this charge separation within their constituent molecules, aqueous solvents are held together by intermolecular forces in which the negatively charged oxygen atom of one water molecule creates a weak bond to the positively charged hydrogen atom of another water molecule. These intermolecular attractions, referred to as hydrogen bonding, in conjunction with its basicity/ acidity allow the **solvent to “attack” any soil** which contains charged portions.

Aqueous solvents are generally **superior to organic solvent methods**. Due to the **benign nature of water**, aqueous solvents are **less hazardous to both human and environmental health** than their organic counterparts. Aqueous solvents are **often corrosive or harmful** to work surfaces, and are often **ineffective** with porous surfaces or soils. Furthermore, due to their immiscibility with organic contaminants, aqueous solvents must be **repeatedly applied** to common organic soiling agents to achieve effective removal. Often the process requires high pressure or ultrasonic technology. Therefore, in weighing the environmental factors involved in replacing organic solvents with aqueous solvents, the **increased volume of wastewater** streams must be considered. When utilizing aqueous solvents, it is tempting to dispose of the waste solution down the drain; however, the **local water authorities** should always be consulted about proper waste disposal.

Types of Aqueous Solvents:

Alkaline aqueous solvents:

Alkaline aqueous solvents have a pH greater than 7. Adding base to an aqueous solution creates an alkaline solvent, which contains negatively charged ions. These negatively charged particles disrupt the polar bonds binding the contaminants to the work surface, as well as obstruct the intermolecular bonds holding the contaminant together, thereby **dissolving the contaminant**. Due to the **corrosive** nature of these ions, inhibitors must be added to protect metallic work surfaces, especially aluminum surfaces. With the right additives and process optimization, alkaline solvents can be utilized with all types of liquid cleansing processes. With thorough **filtration and rinsing**, very high levels of cleanliness can be achieved, although the process may become **water intensive**. Alkaline aqueous solvents are **widely applicable, low waste, and cost effective**.

Neutral Aqueous solvents:

Having a pH of approximately 7, neutral aqueous solvents are mixtures of water and above-mentioned process specific additives. **Weaker than alkaline solvents**, neutral solvents are **effective** at removing light oils, salts, particles, and soils that are easily

removed. For these contaminants, the **dissolving properties** of hydrogen bonding are sufficient to break up and remove the soil. Due to their weaker activity, neutral solvents are **less widely applicable** and are most effective in spray and ultrasonic applications, especially in degreasing processes.

Acidic Aqueous solutions:

Acidic aqueous solutions have a pH less than 7 and may be comprised of mineral acids, chromic acids, or organic acids that are miscible in water due to their acidic properties. Acids have free floating positive charge, making them **excellent** at removing scale, rust, and oxidizing agents from metals. The positive portions of the acid surround and **dissolve** the aberrant negatively charged metal region. Some metal/acid combinations cause hydrogen embrittlement on the surface of the metal. This can be significantly reduced or eliminated by changing acids or heat treating the metal before the cleansing treatment. Because acidic aqueous solvents are less adaptable to general cleaning processes, they are **less common** as cleaning solvents.

Semi-Aqueous

Two different types of semi-aqueous solvent procedures are commonly used. The first involves a solvent in which hydrocarbon/ surfactant cleaners are emulsified in water, meaning that the hydrocarbon/ surfactant exists as droplets suspended in the aqueous support. This arrangement combines the **more effective** contaminant dissolution and high-molecular-weight soil removal characteristics of petroleum-based solvents, with the **increased environmental safety** of aqueous methods.

The other semi-aqueous method entails an initial concentrated hydrocarbon application followed by an aqueous rinse cycle. Again, this method utilizes the **effectiveness of organic solvents** while **lessening the environmental impact** of the overall process by reducing the amount of organic solvent employed. The application techniques for both semi-aqueous methods are similar to those used in aqueous methods, though **flammability**, phase separation, and **odor problems** can arise with the mixing of the solvent types, making equipment design an important consideration.



Super Critical

Supercritical fluids are common gasses such as carbon dioxide under **extreme pressure** and **temperature**. Under these conditions, the fluid no longer exhibits the characteristics of a liquid or a gas, but rather has properties conducive to **high soil dissolution**. The high temperature of a critical fluid confers a high energy level to the individual molecules, which under atmospheric pressure would cause the molecules to increase molecular vibrations and velocity, causing the fluid to expand.

However, because critical fluids are also under high pressure, the high-energy molecules are not able to expand and must exist in a tightly packed, high-energy configuration. It is this dense, high-energy arrangement that gives critical fluids their high soil dissolution properties. This current technology combines application **flexibility** with **low cost**. However, it requires **large capital investment** to design and maintain a system capable of safely withstanding such high temperatures and pressures. **More testing** must be completed to understand the effects on sensitive work surfaces.

GENERAL REGULATORY GUIDANCE FOR NEW MEXICO SMALL BUSINESSES

The purpose of this document is to assist small businesses in New Mexico in trying to understand the environmental regulatory requirements associated with doing business. It is not intended to be a substitute for actual regulations. Businesses are responsible for operating in full compliance of the law (regulations). Each bureau in the New Mexico Environment Department (NMED) has staff available that can help in understanding what is expected of a business from a regulatory point of view.

The Pollution Prevention (P2) Program in NMED will periodically issue specific guidance materials as an attachment to this document for certain businesses. These will be designed to provide additional information to a specific business. For information call the NMED Pollution Prevention Program staff at 505-827-0677 or the Technical Resource Center in Albuquerque at 505-843-4251.

AIR EMISSION REGULATIONS:

The EPA, in an attempt to control air pollution through regulations, has created a set of rules with many acronyms. Since businesses can come across these acronyms in many publications, they are listed below:

NESHAP: National Emission Standards for Hazardous Air Pollutants

NAAQS: National Ambient Air Quality Standards

HAP: Hazardous Air Pollutants

TAP: Toxic Air Pollutants

OEL: Occupational Exposure Limits

VOC: Volatile Organic Compounds

MSDS: Material Safety Data Sheet

CTG: Control Techniques Guidelines

MACT: Maximum Achievable Control Technology

BACT: Best Available Control Technology

GACT: Generally Available Control Technology

RACT: Reasonably Available Control Technology

Much of the national strategy for controlling air pollution centers around the NAAQS. These standards set limits for the concentration in the ambient (outdoor) air of the six most common air pollutants: ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide, and lead.

The EPA has established industry based regulatory requirements for the most serious air pollutants, such as HAPs. In many cases the EPA has also established Control Techniques Guidelines that require industries to use certain technologies, such as MACTs.

Any business that has the potential of releasing pollutants to the ambient (outdoor) air, such as VOCs, HAPs, or Criteria Pollutants, may be subject to the Air Quality Regulations depending on the amount of pollutants being released. These pollutants are used to determine if a facility is a major or minor source of air pollution and whether or not a business will need an Air Quality Permit. A major source is determined as a function of the amount of HAPs or Criteria Pollutants a business has the potential to emit. For HAPs it is 10 tons per year of any single HAP or 25 tons per year of the total HAPs. For the Criteria Pollutant it is 100 tons per year of any criteria pollutant. In addition, the State of New Mexico has added TAPs as a category to be regulated.

Some businesses that would normally be considered a major source can be classified as a minor source by changing the way that they conduct business. Businesses classified as a major source have significant regulatory requirements such as annual fees; maintaining progress reports, records, and a compliance schedule; monitoring emission limits as well as the possible requirement to have specific control technology installed (MACT, GACT, or RACT). All major sources are required to obtain a Title V Permit. It is generally desirable for a business not to be classified as a major source. An EPA document “Potential to Emit, A Guide for Small Businesses” (EPA-456/B-98-003) is available from the EPA and it may aid in understanding Air Quality Regulations.

The State of New Mexico, in addition to HAPs and Criteria Pollutants, has also generated regulations on Toxic Air Pollutants (TAPs) with OELs. These limit businesses from allowing TAPs to be emitted to the outside air around their building. OSHA regulates the same kinds of exposure limits inside of a building.

Due to the complexities of Air Quality Regulations, the harm air emissions cause to the environment, and in many cases the high costs associated with “end of the pipe” control technology, it is in the best interest of any business to evaluate operations with the ultimate goal of eliminating all air pollutants as much as possible.

The Air Quality Regulations that apply to you’re the business will mostly be determined by what the business does. The best way to find out what air quality regulations apply is to contact the New Mexico Environment Department (NMED) Air Quality Small Business Assistance Program (SBAP) at 1-800-827-1294. Businesses that are located in Bernalillo County are locally regulated with respect to air emissions. For assistance, call the City of Albuquerque/Bernalillo Air Quality Assistance Program (AQAP) at 505-768-1964.

HAZARDOUS WASTE REGULATIONS:

Any business that generates waste that is classified as “listed” or “characteristic” in RCRA must deal with this waste as outlined in the New Mexico Hazardous Waste Regulations. The EPA has generated a list of chemicals that are considered hazardous. They have also stated that certain materials that exhibit a hazardous characteristic (ignitibility, corrosivity, reactivity, or toxicity) should be considered hazardous. To determine which products contain hazardous material, contact either the EPA or the New Mexico Hazardous Waste Bureau. In some cases this information will be contained on the Material Safety Data Sheet (MSDS) that came with the product.

It is important to understand that any product that contains “listed” or “characteristic” material is only regulated by the hazardous waste regulations when it becomes a waste. Examples include: when the product is no longer to be used for its intended purpose and is to be gotten rid of, the shelf life of the product has expired, the product leaks from a piece of equipment, or the product is accidentally spilled. It is also important to note that any product to be discarded that contains one or more hazardous materials is also hazardous waste. Examples are: hazardous waste mixed with solid waste, rags to clean up spilled hazardous materials, or wastewater from a process that used a hazardous material.

All businesses that generate hazardous waste are classified based on the quantities of hazardous waste they generate monthly. The three classifications are:

1. Conditionally Exempt Small Quantity Generator (CESQG): generates less than 220 pounds or 100 kilograms of hazardous waste per month. A CESQG cannot accumulate more than 2,200 pounds or 1,000 kilograms of combined hazardous waste at any one time. Usually this amounts to about one-half of a 55-gallon drum. CESQG's may dispose of their hazardous waste by mixing it with a solid waste, assuming there are no free liquids in the waste, and taking it to a permitted municipal solid waste (MSW) landfill. Please verify that the MSW landfill will accept the mixed waste.
2. Small Quantity Generator (SQG): generates between 220 pounds and 2,200 pounds or 100 kilograms and 1,000 kilograms of hazardous waste per month. No more than 13,200 pounds or 6,000 kilograms may be stored on site any longer than 180 days and must be disposed of at a facility permitted to recycle, treat, store, or dispose of hazardous waste.
3. Large Quantity Generator (LQG): generates more than 2,200 pounds or 1,000 kilograms of hazardous waste per month. Hazardous waste with no weight limit may be accumulated for no more than 90 days unless permitted by the State.

Each classification has different record keeping, manifesting, and reporting requirements. Since a business' classification is based on a monthly generation, it is possible to move from one classification to another on a regular basis. All generators of hazardous waste are required to register with the Hazardous Waste Bureau and pay a generator fee based on the classification.

The Hazardous Waste Bureau has an established outreach program that can assist any business in determining their classification and the regulatory requirements that go with it. Contact the Bureau at 505-827-2528.

It is important for any business generating hazardous waste to understand that RCRA has established a “cradle to grave” responsibility for the generator of said waste. This means that if the hazardous waste the business generates contaminates soil, surface water, or ground water in any manner until it is properly disposed of, the business will be held responsible for the clean up of the contamination. The cost of clean up could be substantial. It is therefore imperative for any business to make sure that trained employees handle the hazardous material properly to avoid accidental spills, that the facility only uses permitted haulers, that the waste goes to a RCRA permitted facility, that the waste is properly stored, and that hazardous waste is never disposed of

at the facility. It is also advisable to seal the floor of the facility if hazardous materials in a liquid form are used in the operation.

The best way for any business to avoid the costs of contamination clean up is to eliminate the use of hazardous materials in the operation. A complete understanding of how a business conducts its processes is required to determine the best way to eliminate or at least reduce the amount of hazardous waste being generated. A Pollution Prevention Program has been established at the New Mexico Environment Department to assist businesses in evaluating their processes. The number to call at NMED is 505-827-0677 or you can call the Technical Resource Center in Albuquerque at 505-843-4251.

The New Mexico Environment Department has a 24-hour emergency reporting number that can be called in case of an incident dealing with hazardous material. The number is 505-827-9329.

WASTEWATER REGULATIONS:

Any business that generates wastewater that contaminates surface water or ground water can be held responsible for the cost of clean up. If the contaminant is a RCRA “listed” or “characteristic” waste above the concentration value allowed, then the wastewater is by definition a hazardous waste and must be dealt with under New Mexico Hazardous Waste Regulations. Placing hazardous wastewater directly onto or into the ground is strictly prohibited. Since the cost of cleaning up either surface water or ground water can be substantial, it is in the best interest of any business to eliminate, minimize, and/or control its wastewater.

If non-hazardous wastewater is being discharged so that it can move directly or indirectly into ground water (e.g. septic system, dry sump, etc.), a business is required to file a “Notice of Intent to Discharge” with the New Mexico Ground Water Bureau in accordance with the NM Water Quality Act. The Bureau will then determine if the business requires a Discharge Permit. In some cases the business may be required to request a NPDES Permit from the EPA if the discharge is to surface water.

If non-hazardous wastewater is being placed into a sewerage system, a business is required to notify the local Publicly Owned Treatment Works (POTW) of the nature and concentrations of the contaminants in the wastewater. Attached is a listing of the New Mexico Publicly Owned Treatment Works. Wastewater that has been determined to be hazardous is prohibited from being placed in any sewerage system.

Business need to be aware that even though wastewater going into the sewerage systems is allowed by the POTW, this does not necessarily relieve the potential contamination liability. A good example is a leaking sewer pipe containing hazardous constituents below RCRA levels generated by your business. Over time the wastewater seeps into the ground water and the concentrations exceed State or Federal water quality standards. If the contamination source can be traced back to your business, you could be liable for the cost of clean up. Most businesses will find that the costs associated with proper handling of the wastewater are far cheaper than the cost of cleaning up ground water.

Another potential source of contamination is through the foundation of a building. If a business handles hazardous material as a regular part of doing business and a spill occurs that seeps through cracks in the floor, it will eventually reach ground water. This spill can be detected through monitoring of the ground water. Assuming that it can be traced back to your business, you could then be held responsible for the cost of clean up.

Any business that generates wastewater from sources other than lavatories, or cafeterias should evaluate ways in which the wastewater can be eliminated, reduced, recycled, reused, or handled in such a fashion that the risk of liability for contaminating surface water or ground water is virtually zero. This should include dealing with hazardous waste and all wastewater in a proper fashion, sealing cracks in floors, training of employees, and possible treatment of their wastewater before it leaves their premises.

If you have any questions you can contact the Ground Water Bureau at 505-827-2945 and the Surface Water Bureau at 505-827-0187.

OSHA REGULATIONS:

Every business is required to provide a safe and healthy working environment for its employees. The Occupational Health and Safety Bureau (OHSB) is responsible for making sure businesses are in compliance with OSHA regulations. OSHA regulates permissible exposure limits (PEL's) for employees exposed to certain air contaminants in the workplace. The Bureau conducts regular inspections of facilities and evaluates the establishment for safety and health compliance. The OSHB has a consulting program to assist facilities to be in compliance with OSHA regulations. The service is free of charge to New Mexico small businesses. Attached is a copy of "Frequently Asked Questions" about the program, a copy of "General Health & Safety Issues," as well as a poster to display at your facility. The OSHB can be contacted at 505-827-4230.

UNDERGROUND STORAGE TANK REGULATIONS:

Any business that stores a regulated substance in an underground storage tank that is not directly connected to some sort of processing operation may or may not be regulated by the Underground Storage Tank Bureau (USTB). If the substance is a hazardous waste, it is regulated under RCRA. Since there are a variety of circumstances whereby UST regulations have jurisdiction, it is best to contact the USTB directly for guidance. They can be contacted at 505-827-0188.

SOLID WASTE REGULATIONS:

The Solid Waste Bureau (SWB) deals primarily with regulating solid waste facilities (non-hazardous waste landfills, transfer stations, and recycling facilities) and illegal dumping. The only responsibility for a small business is to see that their non-hazardous waste is either sent to a recycler or to a permitted landfill by a registered solid waste hauler. For information, the SWB can be contacted at 505-827-2853.

SPECIFIC REGULATORY GUIDANCE FOR LITHOGRAPHIC PRINTERS

This briefing paper is intended to be attached to the “General Regulatory Guidance for New Mexico Small Businesses” to provide additional regulatory information specifically for “Lithographic Printers”. It is not intended to be a substitute for actual regulations. If you have questions concerning your regulatory responsibilities, you are encouraged to contact the appropriate bureau.

AIR EMISSION REGULATIONS:

To establish if your business is a major or minor source you will need to calculate the amount of ink, cleaning solvent, blanket wash solvent, and fountain solution you will use per year and their contribution to VOC and HAP emissions. This is best done in conjunction with the Small Business Assistance Program staff. They can be contacted at 1-800-810-7227 or the City of Albuquerque Air Quality Assistance Program at 505-768-1964 if your business is located in Bernalillo County.

HAZARDOUS WASTE REGULATIONS:

Attached to this briefing paper is a document entitled “Fact Sheet for Printers” that can assist you in being compliant with Hazardous Waste Regulations. Characteristic wastes unique to the printing industry are as follows:

- Ignitability: Chemical products such as blanket and roller washes, cleanup solvents, isopropyl alcohol, and inks. Contaminated shop towels being thrown out for disposal.
- Corrosivity: Plate and film processing chemicals, particularly etching chemicals. Acids, waste battery acid, and alkaline cleaners, depending on their pH.
- Reactivity: Waste Bleaches and oxidizers.
- Toxicity: Waste fixer, plate processing chemicals, ink, and cleanup solvents, and specific pesticides.

Many other chemicals are used that would contain “listed” constituents. Most of the “listed” wastes are in the “F” category, which are generally solvents. Typical examples are isopropyl alcohol, methanol, toluene, and trichloroethane, others are listed on the “Fact Sheet for Printers”. If in doubt, check with the Hazardous Waste Bureau.

WASTEWATER REGULATIONS:

The greatest potential problem is the silver in the films and fixer. Used fixer should either be sent to a recycler or treated on site by using a silver recovery system such as one with metallic replacement cartridges. Never discharge fixer to the sanitary sewer system without recovering silver and without permission from the Publicly Owned Treatment Works (POTW).

OSHA REGULATIONS:

Attached to this document is a checklist entitled “Printing Industry Health & Safety Checklist” that can assist you in being compliant with OSHA.

UNDERGROUND STORAGE TANK REGULATIONS:

There is nothing unique in the printing industry that isn’t already covered in the General Regulatory Guidelines.

SOLID WASTE REGULATIONS:

There is nothing unique in the printing industry that isn’t already covered in the General Regulatory Guidelines.

ADDITIONAL SOURCES OF INFORMATION:

An EPA document “Federal Environment Regulations Potentially Affecting the Commercial Printing Industry” (EPA744B-94-001) is available that can help you understand the federal regulations. Keep in mind that all state regulations are required to be at least as strict as the federal regulations. Some New Mexico state regulations, such as the Air Quality and Hazardous Waste Regulations, refer to the federal version in their implementation.

Pollution Prevention and Regulatory Compliance Contacts for New Mexico

STATE AGENCIES:

Green Zia Environmental Excellence Program

Dave Wunker
NM Environment Department
Office of the Secretary
PO Box 26110
Santa Fe, NM 87502
505-827-0677
FAX: 505-827-2836
E-mail:
dave_wunker@nmenv.state.nm.us

Air Quality Bureau

Steve Dubyk
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-1294
FAX: 505-827-0045
E-mail:
steve_dubyk@nmenv.state.nm.us

Hazardous Waste Bureau

Debby Brinkerhoff
NM Environment Department
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502
505-827-2528
FAX: 505-827-1833
E-mail:
debby_brinkerhoff@nmenv.state.nm.us

Occupational Health & Safety Bureau

Kevin Koch
525 Camino de los Marquez, Suite 3
P.O. Box 26110
Santa Fe, NM 87502
505-827-4230
FAX: 505-827-4422
E-mail:
Kevin_koch@nmenv.state.nm.us

Ground Water Quality Bureau

Maura Hanning
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2945
FAX: 505-827-2965
E-mail:
maura_hanning@nmenv.state.nm.us

Solid Waste Bureau

E. Gifford Stack
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2853
FAX: 505-827-2902
E-mail:
gifford_stack@nmenv.state.nm.us

Underground Storage Tank Bureau

Joyce Shearer, Ph.D.
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-476-3779
FAX: 505-827-0310

E-mail:

joyce_shearer@nmenv.state.nm.us

Please note that a list of all Public Owned Treatment Plants (sewage treatments plants) are listed for all of New Mexico on the following page. Waste Treatment Plant operators are important regulatory contacts for small businesses. Please refer to the list and contact your local plant operator for information specific to your community and business.

City of Albuquerque

Public Works Department

Bob Hogrefe
Southside Water Reclamation Plant
4210 Second Street, SW
Albuquerque, NM 87185
Ph: 873-7030
Fx: 873-7087
Rhogrefe@cabq.gov

Environmental Health Department

John Liberatore
EHD/APCD
P.O. Box 1293
Albuquerque, NM 87103
505-768-1964
FAX: 505-768-2617
E-mail: jliberatore@CABQ.gov

New Mexico State University

Chris Campbell
WERC P2 Center
1155 University Blvd., SE
Albuquerque, NM 87106
505-843-4251
E-mail: chrisc@werc.net

Online Resources:

US EPA Printing Compliance Assistance Center:www.pneac.org

US EPA: Design for the Environment: www.epa.gov/opprintr/dfe

Additional Sources of Information:

The New Mexico Environment Department's Hazardous and Radioactive Materials Bureau offers free on-site technical assistance for small businesses to help address small business hazardous waste issues. Please contact the Bureau at 505-827-2528 and ask for the Hazardous Waste On-Site Assistance Program for a consultation.

The City of Albuquerque Public Works Department has a guidebook on pollution prevention for the printing industry. Please contact Bob Hogrefe at 505- 873-7030 for a copy.

FACT SHEET ON CONTAMINATED RAGS AND WIPERS

This fact sheet is provided by the New Mexico Environment Department's Hazardous and Radioactive Materials Bureau (HRMB) to give regulatory guidance to those businesses that generate rags and wipers that may be contaminated with solvent, oil and other materials.

In order to make an official regulatory decision concerning the status of rags and wipers contaminated with possible hazardous constituents, HRMB sent a letter to the U.S. Environmental Protection Agency, Region 6, outlining HRMB's position and concerns. Upon receipt of this letter, and after subsequent conversations between HRMB and EPA staffs, EPA responded with a letter dated August 30, 1993. In this letter, EPA concurs with HRMB's position on how contaminated rags should be regulated.

Specifically, HRMB will regulate contaminated wipers as per the New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1), which adopt by reference, with a few exceptions, 40 CFR Parts 260-270, in the following manner:

1. If a spent rag or wiper contains a listed hazardous waste or exhibits a hazardous waste characteristic (ignitable, corrosive, reactive, or toxic), then the wiper will be regulated as a hazardous waste. HRMB has not made in the past, and does not make at the present time, a distinction as to when a wiper becomes hazardous waste. Once the wiper is no longer being used, it must be handled as a hazardous waste if it meets the definition of hazardous waste. Therefore, unless the generator is a **Conditionally Exempt Small Quantity Generator (CESQG)** (generating less than 220 lbs of hazardous waste per month), wipers meeting the definition of hazardous waste would have to be manifested to a facility having an EPA identification number.

CESQG facilities are only required to dispose of the hazardous waste correctly. This means that wipers and rags that do not have free flowing liquids can go to the local landfill if the landfill will accept them. Contact the Solid Waste Bureau at 505-827-2938 or the local landfill for this determination.

2. Laundering of wipers is considered a form of reclamation since the spent material, i.e. the wiper containing the contaminants, has been used and as a result of contamination can no longer serve as a cleaning agent without first being laundered to remove the contaminants. Therefore, wipers that are stored on-site prior to shipment off-site or reclaiming on-site must be stored in compliance with 20 NMAC 4.1. This regulation requires that the wipers be stored in a closed container. The Occupational Safety and Health regulations require this container to be metal due to the possibility that spontaneous combustion might occur.

If the facility is a **Small Quantity Generator (SQG)** (generating between 220 lbs and 2,200 lbs of hazardous waste per month) or a **Large Quantity Generator (LQG)** (generating over 2,200 lbs of hazardous waste per month) the requirements regarding storage are much more complex with such

conditions as an emergency communication device, container labeling, weekly inspection of storage area, portable fire extinguishers, and training for personnel, as well as much more.

3. In the case of contaminated wipers being shipped to a laundry for cleaning and reuse, other regulations such as the Clean Water Act, may apply to the wash water. Many municipalities have their own regulations regarding what can go down the drain, contact the local wastewater treatment officials. The hazardous waste regulations apply to the wipers only until they are actually placed into the laundry process. An off-site laundry accepting regulated wipers would have to obtain a hazardous waste storage permit unless it washes the wipers within 24 hours.

In a letter dated January 23, 1991 to Lance R. Miller, Division of Hazardous Waste Management, New Jersey Department of Environmental Protection, from Sylvia K. Lowrance, Director, Office of Solid Waste, EPA stated that "... the Regions and authorized States remain in the best position to determine the hazardous waste regulations' applicability in specific cases." HRMB will enforce the hazardous waste regulations as it deems necessary to protect human health and the environment in New Mexico.

The Hazardous Waste Technical Assistance Section is available to assist all businesses in complying with the regulations. Should you ask the Technical Assistance section to help evaluate your compliance, your business would receive six months amnesty from the Enforcement Section of the Hazardous and Radioactive Materials Bureau. Contact Technical Assistance at 505-827-1512 or 827-1558.

Pollution Prevention Tips:

- Use as little solvent as necessary to get the job done.
- Reuse the wipers as much as possible to reduce the number of wipers that are contaminated.
- Change to a non-hazardous or less hazardous solvent to reduce the number of requirements.
- Wring or drain rags and wipers into waste solvent or waste oil tank to reduce contaminants.
- Use drip pans to catch spills and eliminate the need to use rags or wipers.
- do not air dry contaminated rags or wipers.
- Do not launder or pre-wash the rags or wipers at your facility, residence or local laundromat.

New Mexico Occupational Health & Safety

Bureau

New Mexico Environment Department
Santa Fe, New Mexico 87502

525 Camino de los Marquez - PO Box 26110
(505) 827-4230 Fax (505) 827-4422

Printing Industry Health & Safety Checklist

YES NO

Photo Developing Section

- ☐ ☐ Is an eyewash station available within close proximity?
- ☐ ☐ Do employees have somewhere to wash in the event of contact with the chemicals?
- ☐ ☐ Is PPE provided to the employees (i.e. safety glasses with side shields, gloves, etc.)?
- ☐ ☐ **If so**, have employees been trained on the proper use of PPE?

Press Section

- ☐ ☐ Are all pinch and nip points within the presses where employees work (cleaning or maintenance) covered or guarded?
- ☐ ☐ Has an assessment been made to ensure that employees are not overexposed to noise?
- ☐ ☐ **If no**, have steps been taken to avoid noise overexposure (i.e. noise sampling, PPE availability, or audiograms, etc.)?
- ☐ ☐ Are chemicals (i.e. wash, inks, etc.) properly stored and labeled?
- ☐ ☐ Is PPE, where needed, available to the employees (i.e. ear protection, gloves, safety glasses, etc.)?
- ☐ ☐ **If so**, have employees been trained on the proper use of the PPE?

Paper Binding and Cutting

- ☐ ☐ Are the points of operation guarded (i.e. cutting shares, folding, and binding sections)?
- ☐ ☐ Are pinch or nip points guarded within the machine?

YES **NO**

- ☐ ☐ Has an assessment been made to ensure that employees are not overexposed to noise?
- ☐ ☐ **If no**, have steps been taken to avoid noise overexposure (i.e. noise sampling, PPE availability, or audiograms, etc.)?

Maintenance Section

- ☐ ☐ Does the employer contract out repair and maintenance work to an outside company?
- ☐ ☐ **If no**, does the company have a written lock-out/tag-out program?
- ☐ ☐ Do procedures exist that detail the steps to isolating specific machines from all their energy sources (i.e. electrical, mechanical, pneumatic, chemical, gravity, etc.)?
- ☐ ☐ Are employees adequately trained on these procedures?

General Housekeeping

- ☐ ☐ Are isles and passageways free of clutter?
- ☐ ☐ If forklifts are used within the facility, are they battery powered?
- ☐ ☐ **If no**, have precautions been taken to avoid an employee's overexposure to carbon monoxide gas (CO)?

Note: If any of the above questions that are answered with "Yes", then the condition is probably adequate. If any of the above questions are answered "NO", then re-evaluate the situation, as a violation of the standards may exist. For assistance contact:

**NEW MEXICO OCCUPATIONAL HEALTH & SAFETY BUREAU
CONSULTATION PROGRAM
505-827-4230**

The Consultation Program provides safety and industrial hygiene surveys of workplaces, along with evaluation of, and assistance with the establishment of safety and health programs. The program is administered by the State but is operated separately from the Enforcement Program. The services are primarily targeted to smaller businesses, both public and private. The goal is to reduce workplace injuries and illnesses by helping businesses identify workplace hazards and find effective, economical solutions for eliminating or controlling them. The service is free and there are no penalties or fines, even if problems are found. Participation in this voluntary program has helped many New Mexico Businesses lower their costs associated with worker's compensation claims and increase their efficiency and productivity.

General Health and Safety Issues

YES **NO**

☐ ☐ Do the employees wear respirators?

If so,

☐ ☐ Does the company have a written respiratory protection program?

☐ ☐ Are employees trained to properly wear, clean/maintain, and know in what situations the respirators are needed?

If not,

☐ ☐ Is the indoor air quality such that they are not needed?

☐ ☐ Is there a written Hazard Communication Program?

☐ ☐ Are MSD sheets available for all the hazardous chemicals in the workplace and are

they updated regularly?

☐ ☐ Have employees received Hazard Communication training?

☐ ☐ Are there elevated storage/equipment lofts or platforms present?

If so,

☐ ☐ Are signs showing the weight capacity present?

☐ ☐ If the floors are more than 4 feet above a lower floor, are guardrails present?

☐ ☐ Are all exits marked with signs?

☐ ☐ Are exit doors free to access and are routes to these exits kept free of obstructions?

☐ ☐ Is there a procedure in place for obtaining medical treatment for injured employees?

☐ ☐ Are there first aid supplies readily available?

☐ ☐ Are there fire extinguishers on site?

☐ ☐ Are they charged and ready for use?

☐ ☐ Are employees required to use these extinguishers?

If yes,

☐ ☐ Is the path unobstructed?

YES **NO**

- ☐ ☐ Are they subjected to an annual inspection?
- ☐ ☐ Are employees trained to use them?

If not,

- ☐ ☐ Is there a written policy that requires employee evacuation?
- ☐ ☐ Does the company have an emergency action plan and fire prevention plan?
- ☐ ☐ Has the electrical system throughout the facility been assessed for situations where an employee may come into contact with an electrical current, or the electrical system is such that a fire hazard exists (i.e. bare conductors, faulty equipment, exposed electrical equipment where a flammable/explosive environment may exist)?
- ☐ ☐ Does the employer (if 10+ employees are employed) record occupational injuries and illnesses on the OSHA-200 log?

Note: If any of the above questions that are answered with "Yes", then the condition is probably adequate. If any of the above questions are answered "NO", then re-evaluate the situation, as a violation of the standards may exist. For assistance contact:

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OSHA CONSULTATION/TECHNICAL SERVICES

FREQUENTLY ASKED QUESTIONS

What is the Consultation Service all about?

The Consultation program provides safety and industrial hygiene surveys of workplaces, along with evaluation of, and assistance with establishment of safety and health programs. Although the service was established by the same Act that created the Occupational Safety and Health Administration, and the associated enforcement/compliance agencies on the federal and state level, the Consultation Service does not issue fines or penalties. Since the same regulations are covered, the service allows the employer to benefit from the professional assistance, without fines being imposed.

What does your service cost and who is eligible?

The Occupational Health & Safety Bureau (OHSB) offers consultation services free of charge to New Mexico employers with 250 or less employees on location or 500 statewide. Limited services are available to larger companies. Consultation is offered only at the request of an employer.

What types of places do you visit?

The extent of the OSHA Act is to protect employees in all places of work. These include machine shops, hospitals, offices, chemical manufacturing plants etc. The consultation program is designed to assist employers (especially small employers) in complying with the requirements of OSHA regulations. We therefore, visit any place of employment that has employees.

Where does the Consultation Service get its funding?

The program receives funding from both the federal and the state government.

How long does the consultation process take?

Depending on the size of the company and the scope of the visit, a consultation may take anywhere from one or two hours to a full day. If exposure monitoring is requested or recommended, another day is often scheduled.

What kinds of things do you look at?

In order to evaluate the systems in place, sufficient information from the employer may be needed. This would include assessing existing safety and health programs, the OSHA 200 logs, accident investigation reports, and a walk-through of the facility to identify potential injury and illness hazards in the workplace.

Do we have to let you in all areas?

You, the employer makes that determination. If you requested a comprehensive survey, the consultant will look at all areas.

Can it be arranged for both the safety and the industrial hygiene visits to be conducted on the same day?

Visits are scheduled based on the caseload of the consultants. Where the caseloads permit such an arrangement can be made.

Do I (the employer) have to fix everything you find?

The employer is obligated to correct all serious hazards found by the consultant, within a reasonable time frame. Time extensions are granted for abatement of hazards when needed, if the employer is providing interim protection for employees.

How are hazards classified as “serious” & “other than serious”?

A serious violation results where there is substantial probability that death or serious physical harm could result. An other than serious violation is a hazard that has a direct relationship to job safety and health, but probably would not cause death or serious physical harm.

How much will it cost to correct/fix the hazards identified?

Usually, it is not prohibitively costly to correct hazards identified by our consultants. However, where cost becomes an overriding consideration or where the employer can show that engineering controls are not feasible the employer may seek a variance from OHSB. In this case the employer must show that a combination of work practices, administrative controls, and personal protective equipment will provide equal or better protection for the employees.

Do you come back to verify hazard correction?

For regular consultation visits, a statement of assurance of correction for each hazard is usually acceptable. For special program consultations (SHARP) a follow-up visit is usually conducted to verify correction of hazards.

How do we request an extension of time on corrections?

All extensions have to be requested in writing. The letter should include the reason for the extension, what has been done to date to correct hazards; and if corrections

have not been made, the employer must state what interim measures have been taken to protect the employees.

What is the SHARP Program all about?

SHARP or Safety and Health Achievement Recognition Program is one of our special programs for companies wishing to go the extra mile to establish a fully functional overall safety and health program, in addition to the correction of hazards. SHARP is primarily a recognition program for exemplary companies, but an added incentive for SHARP participants is a one-year exemption from OHSB's general schedule inspections.

Does Sharp keep OHSB enforcement out in all cases?

No, At SHARP sites, OHSB will continue to make inspections in the following situations:

- imminent danger;
- fatality/catastrophe;
- formal complaints;
- referral from other government agencies; or
- follow-up on previously cited violations.

Where can I get information on establishing written programs (i.e. blood borne pathogen, hazard communication, confined space, etc?)

Many of the safety and health programs are available through the New Mexico Occupational Health & Safety Consultation Program. They are available upon request.

How do we know which elements of the safety and health program requirements need to be fixed, if it doesn't show up on your report to us?

It is addressed in the safety & health program management section of the report the employer receives. These issues are also discussed by the consultant with the employer.

Is it necessary to have a written certification of hazard assessment at work sites that do not require (PPE) Personal Protective Equipment for any task?

Yes, according to 1910.132(d)(2), the employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated.

Can you come to our company and conduct a class or safety meeting?

Onsite training and education by consultants will be based on available resources and the employers request. The training and education will be tailored to the nature of the hazards or potential hazards in each specific workplace. Training in specific areas is also available through private consultants and the New Mexico Workers Compensation Administration or your insurer.

Can the consultant come back for specific things such as checking new equipment or processes that we bring on line?

Yes, Visits for specific purposes can be requested, in addition to regular consultation visits.

May I call your office anytime to ask questions?

Consultants are available to answer questions between 7-5pm Monday-Friday

Can anyone gain access to my report?

No, our files are confidential and are destroyed after 3 years.

Will a consultation visit lead to an inspection by OSHA compliance? Will your findings be passed on them?

All information is kept confidential. OHSB compliance inspectors cannot discover where we have been and then inspect those companies. The only time enforcement is contacted, is if a company neglects to correct serious hazards beyond time extensions. Then we are obligated to refer those items to enforcement, but only after we have made every attempt to work with the company.

What determines when a compliance inspection is going to occur? How do they decide whom they are going to visit?

Factors that may trigger a compliance inspection include:

- formal complaints by employees or their authorized agents;
- fatalities;
- catastrophe or major incidents;
- history of the company (previous OSHA activity);
- referral by other governmental agencies;
- general schedule inspections; or
- special emphasis programs

Have you been or will you go to my competitor?

Our service extends to all eligible companies who request it. All information is kept confidential; therefore, no hazards, or processes that may be a trade secret, seen in your facility will be discussed in another place of business.

Where can I get a copy of the regulations?

The Government Printing Office (GPO) processes all sales and distribution of the CFR. For payment by credit card, call (202) 512-1800, M-F, 8am to 4 pm or fax your order to (202) 512-2250, 24 hours a day. For payment by check, write to the Superintendent of Documents, Attn: New Orders, PO Box 371954, Pittsburgh, PA 15250-7954. Regulations and other material are available on the Internet at www.osha.gov.

